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A Current Evaluation of Saskatchewan's Private Forest Resources

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EXECUTIVE SUMMARY

Saskatchewan's Private Woodlot Resources

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FINDINGS

The Farm Woodlot Study has determined that opportunities and options for primary uses of wood fibre from private land in Saskatchewan are limited under the current situation. The main reasons for this are economic constraints; inadequate market demands for wood fibre; and, provincial policies which favour development of Crown resources over private stock, and which enable public companies to obtain wood from the provincial forest at subsidized prices. In addition, the inability of private landowners to provide industry with a secure, reliable, and sustainable source of wood supply contributes to industry reluctance to make use of this resource.

Economic constraints are most strongly felt by small operators whose primary source of income is their woodlot. For these operators, woodlots are not profitable unless economies of scale can be improved through increasing the woodlot size while essentially holding capital costs constant. Provincial wood pricing policies, coupled with low demand for wood effectively eliminates most farmers from opportunities to sell wood fibre to pulp mills for a profit. Changes in both public and corporate policies and market demands are necessary before sales of private wood fibre become 'obvious' economic opportunities.

Secondary processing of wood fibre to produce value-added commodities is economically feasible and profitable. However, to be successful larger land bases (at least 800 acres) with higher quality species mixes (softwoods and hardwoods) than occur on most woodlots are required to produce a secure and sustainable supply of wood. The market for finished products is presently relatively small and not clearly defined, but opportunities do exist for production of veneers, panelling and building timbers. Persons contemplating producing such value-added products must have access to high quality timbers that meet stringent grading standards, and must recognize there is considerable wastage involved; i.e. profitable uses for wood residues must also be found, or else the business' profit margin will be severely eroded. Despite these qualifying statements, entrepreneurial activities that use forest products in new and innovative ways have a reasonably good chance of succeeding; they will, however, appeal only to those willing to take a risk.

The study failed to identify any proven appropriate 'fibre-based' alternative land use options that might be profitable on Saskatchewan woodlots under the current situation of subsidies and policies. However, one must caution that even if woodlot owners were to receive fair pricing for their wood (i.e. ≥ $33/m^3), there is no guarantee that wood fibre would be produced on a sustainable basis: better pricing may accelerate the process of profit-taking through accelerated land clearing. The difficulty in identifying alternative, viable, land use options partially reflects problems with the size and geographic distribution of the private forest resource. This prohibits economies of scale from being realized, and makes difficult the implementation of alternative land management strategies (e.g. cooperatives and group ventures). Another major problem relates to the lack of lending institutions' appreciation of wood fibre as a cash crop to provide collateral critical to the purchase of capital equipment.

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1.0 INTRODUCTION

Forest resource analysts are predicting that global wood fibre demand, coupled with declining availability of supply, will result in a global wood shortage in the coming decades. The perception that wood supplies from provincial forests is tightening is a widely shared view amongst Canadian foresters, and is particularly prevalent in Saskatchewan where 97% of those surveyed voiced concerns regarding growing scarcity. This situation, combined with an underutilization of fibre and other resources on private lands, should result in improved economic opportunities for the development of a private woodlands industry in the future. Several factors, including the lack of organizational structure, awareness of opportunities, management systems, adequate identification of markets and government commitment to private woodlands resources act in combination to inhibit growth and development of the industry.

This report examines the potential for Saskatchewan's private forest enterprises to contribute in a financially beneficial manner to existing and projected demands for timber in the foreseeable future, and examines some alternatives to this conventional use of the forest resource. The specific goals that were identified by the Farm Woodlot Association of Saskatchewan (FWAS) for this project included:

- identifying market opportunities and constraints for utilization of primary wood products from private lands in Saskatchewan;
- conducting an economic analysis of the costs and return on investment relating to woodlot operations, and
- assessing the effects of different organizational structures on woodlot viability.

The study was comprised of three distinct components: 1) Literature Review; 2) Consultation and 3) Economic Analysis and Market Assessment.

1.1 FWAS GOALS

The Farm Woodlot Association of Saskatchewan was founded in 1989 with the following goals:

- to create a forum for communication amongst woodlot owners;
- to ensure that farm woodlot owners receive a fair price for their product;
- to develop the productive potential of private forests;
- to inform and educate the public about the value of the private forest sector and the need for public investment in woodlot development;
- to develop new markets for wood fibre, berries, wild mushrooms and other products of woodlot management;
- to facilitate education and training in woodlot related activities for its members, and
- to encourage other landowners to develop managed woodlots.

2.0 BACKGROUND INFORMATION

Saskatchewan has an area of 65.2 million ha (≈ 162 million acres), of which 29.9 million ha (77.5 million acres) or 46% is forest land. Approximately 15.9 million ha of the forested area is considered productive for commercial purposes; however, for reasons of timber quality and accessibility, only 6.5 million ha (16.8 million acres) is considered commercially available at this time. Of the commercially available forest resource, 88% is owned by the province; harvesting privileges are transferred to the private sector through a forest land tenure system that confers harvesting rights in return for certain management obligations and for payment of crown timber dues.

The remaining 12% of the province's forest resource belongs to the federal government (3%), and private landowners (9%).

As a nation, Canada's position as a world forestry industry is threatened by competition from the developing countries: high productivity of the land base, coupled with lower labour costs, is putting these countries in an increasingly favourable position. On the positive side, substantial natural forest resources combined with a stable social and political environment favour Canada as a reliable

supplier of high quality fibre products. Saskatchewan's forestry sector functions at average to below-average levels with respect to labour and capital productivity for the following reasons:

- high manufacturing costs (fuel, electricity, materials and supplies);
- high labour costs (wages and salaries);
- high transportation costs (long distance to markets);
- emphasis on low-value products (pulpwood and small diameter logs);
- dependence on older harvesting technologies, and
- generally small scale of operations.

In recognition of these limitations, an increasing number of industry analysts are recommending that industry shift from primary wood fibre production towards greater production of value-added commodities and new, innovative combinations of wood fibre and wood combined with other materials.

Approximately 70 communities across central Saskatchewan are considered forestry dependent; direct employment in the forest sector typically involves about 10% of the population in these communities, and exceeds 25% of the population in some towns (e.g. Choiceland, Meath Park, Hudson Bay and Big River).

The Saskatchewan forest industry has traditionally depended on softwood markets; however, recent trends have been to dramatically increase hardwood utilization. Weyerhaeuser Canada Ltd. (WCL) began using hardwoods in their pulping operation in 1985; approximately 40% of the pulp mill operation will depend on hardwoods by 1992 (WCL 1989) with a 20 year average projection for a need of ~ 734 000 m^3/year. The new CTMP (chemi-thermo mechanical pulp) mill under construction at Meadow Lake and scheduled to begin operation in February 1992 will consume an additional 720 000m^3/year by 1994-95.

Timber harvested from Saskatchewan's Provincial Crown Lands totalled 3.3 million m^3 in 1989-90, with an estimated value of $366 million (SPRR 1990).

Disposition of the wood resource was as follows:

- production of pulpwood, plywood bolts and waferboard (58%);
- sawtimber (35%);
- posts, poles, rails and ties (5%);
- fuelwood (2%)

Forest exports, comprised primarily of wood pulp (52%) and other paper and paperboard (37%), contribute an estimated $275 million to the provincial economy. These wood products are supplied by 143 large- and small-scale logging companies, 65 wood industries and 6 paper and allied industries, and together account for 1 job in 56 in the province.

Hardwoods comprise approximately 85% of the forest species on private land, and contain, on a volumetric basis, approximately one-quarter of Satatchewan's total hardwood resource of 265.2 million m^3. Between 1980 and 1985, the number of Saskatchewan farms reporting forest products sales declined by more than half: from 246 in 1980 to 164 in 1985. However, during the same time period, the value of sales from private land forestry increased slightly, from $993 000 to $1 194 000 (Forestry Canada 1990); this increase suggests that remaining operators are managing their woodlots on a more intensive basis, and may be indicative of a shift towards adding greater value to finished products.

2.1 Constraints to Private Woodlot Development

In Canada, most commercial crown timber resources are managed through Forest Management Licence Agreements (FMLA's) which are legal documents signed between industry and provincial governments for access and utilization of timber resources. Industry gains a right of access to the timber in exchange for a fee (stumpage or royalties) based on volumes of timber harvested. The agreements tend to be long-term (>20 years) and vary within and between provinces respecting the financial terms and obligations to forest management and renewal. For the most part, provincial managers have participated in a competitive inter-provincial process of attracting industry to locate within their jurisdictions by using the powers of

financial incentives; these include access to relatively 'low cost' wood fibre. Economic benefits accruing from associated capital investment combined with job creation are frequently cited as the measure of provincial economic success.

The private woodlot resource is dwarfed by the size of crown land holdings in most provinces, and may be viewed by provincial economic managers to be a sector more difficult to organize or motivate to invest in timber management; as a result, government economic policies have historically tended to favour large industrial complexes over small operators. These events, combined with an underdeveloped small woodlot value-added products and marketing industry, have resulted in a wood fibre marketplace characterized by many primary wood producers (woodlot owners) and few buyers (industrial mills). Woodlands operations of large FMLA holders are managed as a cost centre to the profitability of the mills; in contrast, private woodlot owners (exclusive of value-added products operations) must operate their woodlots as their only profit centre. This situation tends to diminish raw material prices where supplies exceed demand.

The emergence and organization of the private woodlot sector in Canada has clearly illustrated that, within this environment, small producers have difficulty in gaining fair market opportunity. In addition, the Licence Agreements between industry and government, generally provide direct or indirect incentives for industry to focus activities within the crown-land base by the inclusion of 'use it or lose it' clauses; industry must strive to harvest the annual allowable cuts or risk the province's power to allocate the surpluses to competitors; large industry generally want to maintain their forest land base as security for the large capital investment in the mills.

The historical use of subsidies and incentives as a means to attract large corporations to inject investment dollars into the respective provincial economies cannot be easily rectified. Fees collected by Saskatchewan in royalties fall vastly short of the total amount expended on the public forest; annual expenditures amounted to approximately $40 million in 1990, which included $8.9 million for silviculture, inventory, forest development and regional operations; a further $32.5 million was spent on fire protection. In contrast, only $3.3 million was collected

in royalties from the major companies for the right to harvest approximately 3.3 million m^3 of wood fibre from Crown lands. In essence, this public expenditure equates to a subsidy of over $\$10/m^3$ for wood fibre. However, the expense is not without benefits. Industry is a major employer; in 1985, the Canadian Forestry Service estimated that the forest industry generated $54 million in wages and salaries within the manufacturing sector of Saskatchewan and an additional $15.6 million from logging activities. The industry adoption of highly mechanized approaches to forest harvesting and processing generally result in fewer primary jobs, thereby impacting and reducing direct job benefits.

Industry is also favoured in that it does not pay a lease fee (and consequently avoids taxation) on the land base harvested. In contrast, woodlot owners incur costs associated with owning the land (taxes, return on capital, investment costs) and must pay fully for all costs associated with management of the resource. Differences in pricing structures are further evident when one compares the prices received by private woodlot owners for wood delivered to the mill for pulping (i.e. about $\$18.82/m^3$ for hardwoods > 50 km from the mill), versus the price paid by industry for wood plus the associated management inputs from provincial forests. The cost of crown wood incorporates a harvesting and delivery component ($\sim\$18/m^3$), a management component ($\$7\text{-}8/m^3$) and a protection component ($\$10/m^3$) which adds up to $\$35\text{-}37/m^3$. If the crown forest were managed as a separate profit centre isolated from the mill complex, the value of the wood delivered to the mill would have to reflect return on investment associated purely with forest harvesting and management; this is not the case through the FMLA process. However, even if the private woodlot owner were to receive an equivalent of $\$35\text{-}37/m^3$, there is no guarantee at the present time that the woodlot would be managed responsibly for the combined objectives of profitability and sustainability.

SPRR has few explicit written policies regarding the supply or disposition of forest resources and has *no* policies with regards to timber supplies on private land. Quebec and New Brunswick are the most progressive provinces respecting the development of programs, policies and incentives designed to assist the private woodlot owner. Systems which exempt or reduce private forest land from taxation

are common, and many provide additional incentives to manage private forest land: for example, the Managed Forest Tax Reduction Program (Ontario) reduces property taxes by 50% on managed land, and allows property tax exemptions for up to 20 acres of forest land, while Quebec encourages maintenance of tree stand density through "frozen assessments" which hold the tax rate stable for 10-year periods; in addition, Quebec also provides low interest loans to private foresters. Other provincial programs provide landowners with services including financial assistance, marketing advice, training programs, and professional and technical advise. Several provinces also recognize that private land foresters need assistance with silviculture and protection from fire, insects, disease and competition, and may provide these services through such mechanisms as cost-shared programs and/or flat-rate taxes on forest land.

These efforts have enabled landowners to optimize forest productivity through effective land management strategies. In Quebec and New Brunswick the inclusion of wood under respective farm products legislation has led to the creation of marketing boards or agencies which were instituted primarily for the purposes of negotiating prices between buyers and sellers. Large industries must reach agreements with the marketing boards respecting price and volume prior to provincial approval to access the crown resource. Landowner cooperation through such structures as group ventures, has enabled some small-holders to overcome the problems caused by land fragmentation, and to achieve economies of scale in forest production by pooling eligible properties together for forest management purposes; members of the group then share in both the profits and the capital expenses incurred in forest management.

Security of supply and timing of delivery are both factors which influence industry's decision to purchase wood. The Prince Albert operation of Weyerhaeuser Canada purchases a significant proportion (40%) of its incoming wood, although a small fraction of this (~ 150 000 m^3) comes from private lands. From the industry perspective, the reasons why private wood does not make up more of their volume relates to its higher "costs" in terms of scheduling of incoming loads, format of wood delivery, and more labour-intensive handling requirements. Improved efficiency of delivery could therefore make this supply more attractive to

industry . Low prices may also act as a deterrent to the delivery of more private wood to the mills.

Policies in the agricultural sector act further to discourage woodlot management. Tax breaks and agricultural programs provide incentives for land conversion; there are no provincially-funded programs in this province promoting maintenance of existing forest cover on private land. The federal government has been more active in this regard through its funding of the FRDA agreements, and recently PFRA has provided direct support to the Farm Woodlot Association to produce educational materials.

Recent estimates that Saskatchewan received > $14 billion in agricultural assistance programs between 1982-91 translates into subsidy payments of ≈ $280,000 / farm unit based on 50,000 farms, or about $30/productive acre/year. Faced with these types of structured and *ad hoc* government programs it is exceedingly difficult to motivate ambivalent land owners to consider woodlot management as a viable option.

Woodlot operators may also impose self-restrictions on the use of their resource, thereby precluding opportunities to gain financially from their private forest. Many woodlot owners value their woodlots for aesthetic and other reasons; timber production for other than subsistence use, may be of secondary importance. The availability of wood from private lands may therefore be considerably less than the absolute volume of private land timber resources thought to exist in this province, at this time. This underscores the need to educate people on the viability of woodlots and to diversify their farm operations and contribute to the economic stability of the farm unit.

2.2 Economics of Production

The economics of wood production from private land was evaluated using a computer model that was specially tailored to the needs of this industry. The Farm-Woodlot Planning Model is an integrated grain farm and woodlot computerized financial model, which projects income statements, balance sheets and cash flows based on estimates of revenues and cost data. Three woodlot operational scenarios

were evaluated: 1) a mixed grain farm-farm woodlot, 2) a stand alone woodlot, and 3) a value-added woodlot.

The financial analyses proceeded by setting a base case for each of the three scenarios. The base case included our best estimates of expected revenues, costs and cash flow. Financial performance was assessed in the base case by calculating break-even selling prices, break-even transportation costs and hourly returns to owner-operator time.

MIXED GRAIN FARM- FARM WOODLOT (SCENARIO #1)

This scenario assumes a grain farmer has some woodlot available and decides to harvest either selectively or clear cut. In this scenario, the incremental capital costs would be small, since the farmer already owns most of the equipment necessary. Most of the costs would be variable with the main one being the opportunity cost of labour.

The results indicated that, given the initial revenue and cost estimates, the return to woodlot labour is very low. This would prohibit the use of hired labour, and in most cases, the return to labour would be lower than the farmer's opportunity cost of labour. The conclusion is that the economic returns are not significant enough to attract new entrants into the woodlot industry.

Using the financial model, we increased the pulpwood price until the incremental cash flows provided a return to labour of $11.00 to $12.00/hour in year one, and inflated thereafter. The pulpwood price required to produce a return to labour of $12.00/hour is approximately $33/$m^3$.

The critical variables are **pulpwood price** and **transportation costs** (distance from market). At pulpwood prices of $18.82/$m^3$ the best strategy for a farmer, under the current situation, would be to clear cut the woodlot, and use the proceeds to finance the costs of preparing the land for grain farming. If the woodlot land is not acceptable for grain farming, the best strategy is to find a use for the wood, other than pulpwood.

If pulpwood prices were to increase to ≈ $33/m^3$, the limiting factor becomes distance from the market; at current pulpwood prices, only those woodlots very close to market, with very low transportation costs, will earn a reasonable return to labour.

Stand Alone Woodlot Operation (Scenario #2)

Scenario #2 represents a stand alone woodlot where capital costs are relatively low and the woodlot can be either owned or leased. The results of scenario #1 indicate that at current pulpwood prices, this scenario is not feasible. Unlike the mixed grain farm-woodlot operation, the stand alone woodlot manager must purchase capital items including tractor, truck, tools, buildings, etc., thereby reducing the return to labour.

The financial results indicated that the woodlot operation is not expected to be profitable even before providing a return to labour. Using the financial model, a leased woodlot must be increased to ≈200 acres, where 100 acres is farmed for pulpwood and 100 acres for firewood, before a cash breakeven is reached.

In addition, if the woodlot operator leased land >50 km from the market, and worked full time in the woodlot (1,820 hours) and harvested 1,226 m^3 from 700 acres, he/she would earn only $5.81/hour for his/her labour. The results also indicate that the operator must be able to achieve economics of scale, by either increasing woodlot size while holding capital costs fixed or by keeping capital costs very low. Increasing the distance from market beyond 50 km sharply reduces returns.

Value-Added Woodlot (Scenario #3)

In this case, the woodlot operator harvests the wood and then adds value before selling. Some examples of adding value are producing sawlogs, flooring, channel board, siding, shakes and log buildings. To do this, the operator must have additional equipment to produce the value-added products, and depending on the size of the operation, additional hired labour. The main advantage to adding value to the product is the significantly higher selling price that can be demanded.

The owner-operator of a 1000 acre woodlot would work 2,000 hours per year in the woodlot operation. At a wage rate of $12.00/hour, the return to labour of $24,000 can be demonstrated in the first year; a small return to management in the amount of ≈ $ 578 is also expected. The long-term average return to management was estimated at ≈ $9,300/yr. It may therefore be considered the most sustainable option in that the rate of return on all aspects of an operation would strongly encourage the maintenance and harvest of a woodlot over the long term.

The financial results also indicate that a woodlot of less than approximately 800 acres (5 quarter sections) is not economically viable under the modelled conditions. It generally did not matter if the woodlot was on farmer-owner land or leased land, although the costs of leasing tend to slightly reduce net cash flows.

In the value-added case, a much larger gross profit margin due to the higher selling prices makes the transportation costs less significant and allows the woodlot enterprise to absorb a higher cost of transportation. Hence, the value-added woodlot operation can be viable even when 200 km from markets or leased lands.

From the financial risk analyses results, we have concluded that a ***value-added woodlot operation*** can be viable in Saskatchewan. The key variables are quantity of sales (as determined by the size of the "woodlot"), and selling prices, and to a lesser extent, transportation costs.

2.3 PRODUCT AVAILABILITY;

Saskatchewan's non-industrial private forests are distributed throughout the mixedwood forest, but are in general located south of the Commercial Forest Zone which is the primary source of timber to industry. Wood volume measurements from private land equal to 59.4 million m^3 and 10.52 million m^3 for hardwood and softwood timber, respectively, for a total volume of just under 70 million m^3 of wood. Long range sustainable yield from these stands approximates 850 000 m^3 for hardwoods, and 117 000 m^3 for softwoods.

Despite the relative abundance of hardwoods on private land in Saskatchewan, utilization is relatively low at present. Dramatic actual and projected increases in

large mill requirements for the hardwood fibre may lead to increased future demands from private lands.

Timber quality from private forest resources in Saskatchewan is not well known, but is expected to vary substantially across the geographic base of private woodlands.

3.0 ECONOMIC OPPORTUNITIES

A number of economic opportunities are associated with the maintenance and management of a woodlot. These include a variety of fibre and non-fibre potential revenue sources.

FUELWOOD

The ability of Saskatchewan's woodlot operators to supply fuelwood to consumers is again constrained by distance to the market. Major urban centres such as Saskatoon and Prince Albert will remain economically inaccessible to most fuelwood suppliers, although a small number of operators will be able to sell some product in these markets. Fuelwood demand in rural areas is unlikely to increase substantially, given that the population of many of these communities is declining, and cheap natural gas is available in most areas. However, while fuelwood production has only limited potential to contribute directly to private incomes, self-use of fuelwood presents a direct saving to those individuals who use their private wood resource for home heating and/or cooking. Personal uses of wood can reduce cash outflows from $500 to $2 000 annually, a sum equivalent to 5 to 10% of many private woodlot owners' net annual incomes.

Several techniques exist which can be used to improve wood's poor combustion characteristics, which at the same time renders the product into a form which is more readily transported and stored than it is as unprocessed fuelwood. Ways in which wood can be used to provide energy include direct burning to produce steam or electricity, gasification, and pyrolosis. Drying and pelletization is recognized as a practical means to increase woods' bulk density and energy, and a number of commercial systems have been available in North America for some years (Stone

and Associates 1983). Most systems use direct burning to generate the heat needed to dehydrate the wood fibre, then reduce particle sizes through a milling process, and densify (pelletize) the residue using a combination of elevated temperatures and pressures. The drying process itself consumes up to 10% of the available wood supply, thereby affecting the economics of production. Despite these limitations, pelletized wood products are considered suitable for small-scale institutional, industrial and residential uses, and may be very suitable for use in rural areas.

CHRISTMAS TREES

The Christmas Tree industry in Saskatchewan is still in its infancy. To date, only one plantation has any mature trees suitable for market; several individuals have immature stock in the ground, for a provincial total of approximately 300 000 seedlings. This number is being supplemented by about 60 000 new seedlings per annum, of which an unknown percentage are lost due to disease, drought and owner disinterest.

The local market is relatively small with a total annual demand of approximately 120,000 trees; 95% of this market is currently supplied by imported trees from British Columbia and the U.S.A.. There may be room in the local market to support a few more growers, but market saturation is a definite risk.

"VALUE-ADDED" WOOD FIBRE MARKETING OPPORTUNITIES

Woodlot operators who proceed to finish raw wood into consumer-ready products receive more than twice the financial return on their time and investment than those who sell unfinished wood products for fuelwood consumption or refinement at other facilities; in addition, these operators are less constrained by the need to be located close to their market, and can sell their products at distances up to six times as far as those dependent on selling to mills and other industries. However, few members of the Woodlot Association are engaged in this type of activity, and most do not foresee value-added opportunities as something that may be important to them in the future. Value-added operations are best suited to lands which support a high quality mixedwood resource.

Opportunities are thought to exist for value-added approaches in Saskatchewan, but for the most part, these have not been exploited. Buy Saskatchewan Corporation identifies a local market need for furniture construction, framing and casework (e.g. kitchen cabinets), but could not readily identify any Saskatchewan companies engaged in this type of activity. In contrast, several Alberta firms are known to be using hardwoods for production of similar value-added commodities. A major reason for Saskatchewan's failure to produce value-added hardwood products in any abundance relates to the difficulties in achieving and maintaining wood quality: i.e. high moisture content causes tendencies for hardwoods to become unstable, hence, they need to be kiln dried to reduce their moisture content to around 8%. In the process of doing this, the wood tends to shrink, and its quality may be affected. A rating and grading system is therefore necessary, requiring the presence of a certified wood grader as wood comes from the mill. The need for a kiln or other drying equipment, plus the need for on-hand expertise therefore precludes many small independent woodlot operators from pursuing value-added opportunities with their wood products.

AGROFORESTRY OPPORTUNITIES

Agroforestry has significant applications in western Canada and can have beneficial effects on crop production as well as timber yields. While the latter benefits take a long time to accrue, those interested in taking a long-term view in investing in their land base can over time grow sustainable timber volumes of sufficient quality and quantity to meet market needs and contribute positively to on-farm incomes.

Increases in a variety of different crop yields for alfalfa (1.4x increase), followed by grass-legume hay, corns and sunflowers, flax and canola, barley and spring wheat can be expected in the presence of shelterbelts.

Benefits for using forestry land between clear felling and replanting include:

- additional income generated by alternative land uses;
- land is cleared and manured by free-ranging animals (i.e. pigs);
- animal producer gains land at a relatively low rent.

MUSHROOMS, BERRIES AND OTHER FOREST RESOURCES

Attempts to harvest and/or culture assorted forest resources or related crops have met with varying degrees of success in Saskatchewan. For the most part, efforts to harvest mushrooms and wild berries from the forest (i.e. to harvest an unmanaged resource) have not been shown to be economically attractive; however, as discussed below, there does appear to be some potential for good economic returns when these resources are placed under intensive management. The main limitations facing the wild food harvest industry are that it:

- provides employment for only a short period (i.e. about 3 weeks for blueberries);
- offers a low return to labour,
- requires substantial travel time,
- may be fraught with difficulties involving the storage, purchase and distribution of the harvest (Northern Harvest Enterprises 1989), and
- is subject to the vagaries of the weather.

Despite this unfavourable prognosis, some wild food harvesting operations are providing a viable source of income supplement. For instance, Len Donais of "The Root Cellar" in Prince Albert supplements his market garden/bedding plant business with sales of a variety of forest products, including northern wild blueberries, lingonberries, high bush cranberries, mushrooms (primarily chanterelles, but also pine mushrooms and boletes). In addition, mosses, lichens and birch bark products are sold to distributors in the United States for use in the floral and crafts industries which have a high demand for "natural" products.

Saskatchewan produces several varieties of edible wild mushroom, including chanterelles, morels, boletes, false morels and pine mushrooms. The advantage of pursuing development of the wild mushroom industry is that it requires little capital investment outside of the purchase of a dehydrator, and packaging and transportation of the product to market. With market development, the industry could contribute in excess of $200 000 per year to the provincial economy

Two important agricultural benefits result from blueberry cultivation: firstly, it allows marginal agricultural land to be brought into production, thereby adding directly to the agricultural economy, and secondly, the perennial ground cover and

dense mat of underground rhizomes formed by the blueberry plants protect soil from erosion. Marketing of blueberries has involved selling the fruits to berry buyers throughout the province. Berries are sold in fresh or frozen form, and as value-added products such as juices, fruit leathers, concentrates, jams, jellies and pie fillings. High bush cranberries also show potential for processing into other value-added products. However, markets for most other wild berries (i.e. lingonberries, saskatoons, chokecherries, strawberries and raspberries) appear limited to roadside stands, farmer's markets, and grocery stores at the present time.

Pursuit of the health food and pharmaceutical markets may be a worthwhile economic activity that would require little capital outlay except in the development of a marketing plan. Forest products which could be sold to these industries include such species as reindeer moss, labrador tea, wild mint, cattail, fiddlehead (ostrich) fern, wild onions and wild mustard.

MAPLE SYRUP

Maple syrup has recently been identified as a potential product from Manitoba maples in Saskatchewan. While no commercial production of this product has yet been attempted in Saskatchewan, there appears to be sufficient opportunities for a producer to market maple products though supermarkets, gift and health food stores. Potential producers may wish to attempt:

- drawing on information from Ontario, which has a long history in marketing maple syrup and other maple-based products; and
- approaching Forestry Canada to gather more information on tree management.

Recreation Development Opportunities

Opportunities to diversify woodlot operations by providing recreational opportunities to tourists from within and outside of the province appear limited at the present time. The main reason for this is that to attract tourists, most recreational developments require considerable capital expenditure, although there is no guarantee this will be recouped once the public arrives. Development of cross-country ski trails may not incur much additional cost on a managed woodlot, but could only sustain low user fees. Some intensively managed tourism facilities have been developed on private woodlots (e.g. Snow Castle Lodge at Candle Lake); however, despite the abundance of amenities offered by these facilities, visitor usage is currently in a depressed state. Provincial taxation levels are cited as the prime reason for low visitation, and appear to have adversely affected local (i.e. visitors from Saskatchewan), other Canadian, and international visitation. Nonetheless, recreation is a competitive market and successes are dependant upon broad initiatives to attract tourists to Saskatchewan.

Wildlife Viewing, Hunting and Game Farming/Ranching

Economic analysis of game ranching suggests that the industry can generate high potential profits from a land base of approximately 240 ha. The opportunity to further engage in mixed game farming- forest fibre management operations may present additional economic opportunities as part of a diversified multi-objective approach to land use. The relevance to woodlot operations is obvious in that 'woodlot' lands may be considered ideal 'habitats' on which to conduct game farming enterprises.

Industry growth trends, and the testimony of growers suggest that commercial production is currently profitable. Commercial game production is economically sound business because

(1) Traditional agriculture production businesses are declining;

(2) Market demand for game products is relatively high; and

(3) Production costs of game animals are relatively low.

Game ranching has been claimed by its proponents as 'sustainable development' in action and by its critics as a menace to the natural world. As the debate unfolds, the contribution that the industry brings to diversification appears as realistic as the outbreaks of tuberculosis among game farmed animals. However, one cannot necessarily argue against the fundamental logic of combining landscape management with economic enterprise and the wisdom of combining animal unit management with that of biomass or wood fibre. The two endeavours may complement one another to serve the ends of the land and enterprise.

The economics of 'selling' viewing are suspect at this time as the public has not demonstrated a strong willingness to pay private landowners directly for viewing opportunities. Private landowners are forced to compete with crown lands, particularly Parks for providing this experience. Conversely, greater opportunities likely exist for 'paid' hunting, primarily because the world has a large hunting fraternity which have limited opportunity to harvest. Saskatchewan boasts some of the best 'potential' opportunities in wildlife outfitting experiences, but these have been largely restricted by regulations which severely limit the licencing of non-resident hunters.

Opportunities for exploiting wildlife resources on private land are limited where the land base is small in size. Establishing hunting opportunities require a large land base, and therefore would best be served by group ventures whereby several landowners would agree to maintain woodlots as wildlife habitat and would receive remuneration for right of access to lands. The woodlots could be managed for both fibre and wildlife habitat simultaneously to enhance the return to the owner. Paid hunting is highly successful in places like Texas and New Mexico where large ranches cater to hunters, capitalizing on agriculture, wildlife and the service industry to hunters. It has significant potential in Saskatchewan, but requires that landowners control access and hunting activities. Changes in provincial legislation would be required respecting the availability of non-resident licences and liberalization of the outfitting regulations.

4.0 STRATEGIC PLAN AND RECOMMENDATIONS

The FWAS must recognize that opportunities to diversify and stabilize incomes through exploitation of private land forest are limited under the current situation given:

- the existing structure of government and industry policies in Saskatchewan;
- the scarcity of markets for wood (primarily hardwood) products, and
- the relatively small size and wide geographic distribution of private forest holdings in the province.

The role of the FWAS should be primarily to act as a coordinating body to facilitate member cooperation and sharing of information; in particular, FWAS should:

- act as a lobby group;
- provide members with information and services, and
- encourage woodlot owner participation in the Association, and
- press for development of a legislative basis for alternative management structures

Issues which need to be raised in the public conscience fall into 4 general categories:

- recognition of the value of wood on private lands;
- recognition of private lands as a forest resource;
- recognition of diverse economic potential private forest lands provide for recreation, game farming/ranching, paid hunting etc., and
- acceptance that private forestry enterprises are a legitimate option for achieving diversification of the Saskatchewan economy.

FWAS needs to gather and disseminate information amongst its members. This information should pertain both to the status of the resource on private land, and should keep abreast of market trends and technological advances. Members should be required to provide the Association with specific details regarding their forest resource and harvesting practices, their personal objectives for its use, and information pertaining to markets for products. Data needs include:

- forest inventory;
- stand volumes, density and relative health
- annual allowable cut, and
- silvicultural needs

In addition to providing member services, the Association must accept and impress upon its membership that primary wood-using opportunities have potential to supplement other farm income. The Association should actively encourage woodlot operators to pursue value-added activities and to produce finished lumber products of any kind.

4.1 MANAGEMENT STRUCTURES TO IMPROVE WOODLOT VIABILITY

Three alternative action plans that will enable FWAS to coordinate its activities and improve the efficiency of private land forestry in this province are proposed. The first plan is based on the premise that woodlot operators will continue selling unfinished wood products to conventional industries, and proposes a system that may improve woodlot efficiency; the second plan proposes a mechanism that would allow woodlot owners to pursue value-added activities. Both plans call for improving economies of scale through cooperative (group) ventures. The third plan presents a strategy for expanding the opportunity for woodlot owners through greater access to the crown land base.

GROUP VENTURE MANAGEMENT PLAN FOR SERVING CONVENTIONAL (FIBRE) INDUSTRIES

The planned activities described in the following section would be best suited for the areas around Meadow Lake and Prince Albert. The new CTMP mill under construction at Meadow Lake has substantial wood requirements, and a commitment to purchase wood from private sources; Prince Albert Weyerhaeuser mill currently purchases private lands wood.

GOAL: To Achieve Income Stabilization and Diversification through Marketing Primary Wood Products

OBJECTIVES: Improve Security of Supply and Delivery of Wood to Industry

TASKS:

Identify woodlot owners interested in participating in Group Venture activities;

Identify owner objective(s) for their land and determine the optimal use of each parcel, keeping in mind alternatives (e.g. Xmas tree production, other forest products, recreational and aesthetic value, value to wildlife);

Zone woodlot membership into Farm Woodlot Management Units (FWMU's) centred around target industries (to a maximum distance of 120 km);

Undertake inventory of wood volumes and standing timber within each FWMU;

Determine the sustainable allowable annual cut (AAC) that could be achieved within the FWMU;

Approach target industry with a detailed proposal to guarantee delivery of a specified wood volume at pre-defined intervals (e.g. quarterly or bi-annually);

Determine harvesting schedule to selectively remove wood from woodlots within the FWMU over a 20-year period;

Line up Contractors to do wood pick-up and delivery to mills; silvicultural work, and reforestation;

Co-ordinate movement of individuals and equipment between woodlots;

Prepare detailed submissions to federal and provincial governments for funding; propose policy options to cabinet;

Approach urban organization with Xmas Tree delivery proposal or sale of other forest products.

GROUP VENTURE MANAGEMENT PLAN FOR VALUE-ADDED OPPORTUNITIES

Value-added opportunities have clearly been identified as potentially attractive economic opportunities for private land woodlot owners. However, these operations require access to a minimum land base of 800-1000 acres which supports a high quality mixedwood forest. Unfortunately, most woodlots in Saskatchewan fail to address both criteria.

GOAL:	To Achieve Income Stabilization and Diversification through Marketing Value-Added Wood Products
OBJECTIVES:	Achieve Security of Supply and Develop Infrastructure to Process Secondary Wood Products
TASKS:	Identify woodlot owners interested in participating in group venture activities;
	Identify owner objectives for their land and determine the optimal use of each parcel, keeping in mind alternatives (e.g. Xmas tree production, other forest products, recreational and aesthetic value, value to wildlife);
	Zone woodlot membership into Farm Woodlot Management Units (FWMU's) centred around target markets (i.e. major population centres such as Prince Albert and Saskatoon);
	Undertake inventory of wood volumes and standing timber within FWMU;
	Determine the sustainable allowable annual cut (AAC) that could be achieved within the FWMU;
	Identify land base on which new venture is to be situated;
	Conduct market study and develop detailed business plan; identify advertising strategy for finished products;
	Prepare detailed submissions to federal and provincial governments for funding; pool capital and arrange purchase of mill (if required), and kiln-drying facilities;
	Determine harvesting schedule to selectively remove wood from woodlots within the FWMU over a 20-year period, and initiate activities.

CROWN LAND ADDITION: MANAGEMENT PLAN FOR VALUE-ADDED OPPORTUNITIES

Value-added approaches have clearly been identified as potentially attractive economic opportunities for private land woodlot owners. However, these operations require access to a minimum land base of 800-1 000 acres which supports a high quality mixedwood forest. The best forest resources currently exist on Crown Lands, most of which are allocated through the FMLA process, thereby restricting or limiting the opportunity of the small operator. However a large amount of forested Agricultural Crown Lease land also exists; these lands are primarily managed for grazing and secondarily for wildlife; relatively large areas support forest cover which could contribute substantially to the expansion of the woodlot business.

GOAL:	To Achieve Income Stabilization and Diversification through Marketing Value-Added Wood Products by providing existing woodlot owners with access to long-term leases on the Agricultural and Provincial Forest Crown land base.
OBJECTIVES:	Achieve Security of Supply and Develop Infrastructure to Process Secondary Wood Products
TASKS:	Identify woodlot owners interested in expanding the size and scope of woodlot management operations;
	Establish complementary objectives for the management of the private and leased Crown lands;
	Undertake inventory of wood volumes and standing timber within the private-crown woodlots;
	Determine the sustainable allowable annual cut (AAC) that could be achieved within the woodlots;
	Develop long-term management plans to satisfy the Crown forest management principles of the province and the objective of value-added product development;
	Determine harvesting schedule to selectively remove wood from woodlots within the woodlot over a 20-year period, and initiate activities.

ACKNOWLEDGEMENTS

TAEM would like to acknowledge a number of individuals who provided information critical to the development of this document. In particular, the members of the Farm Woodlot Association who gave freely of their time to provide data on their woodlots relevant to the construction of the financial models. In addition, the assistance of FWAS members for organizing the community meetings and filling out questionnaires was greatly appreciated.

Special thanks to Hector Shiell of the FWAS and Jim Johnston of Forestry Canada for their many hours of consultation and review of the initial draft reports. Their suggestions were forthright and contributed substantially to the final product.

The role that the Agricultural Development Fund of Saskatchewan Agriculture and Food to have the foresight to maintain their support of the Farm Woodlot Association and this project demonstrates their commitment to agricultural diversification in Saskatchewan.

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Abstract

The Farm Woodlot Association of Saskatchewan (FWAS) was formed in 1989 with a broad mandate to promote woodlot management in Saskatchewan as an economic enterprise and sustainable land use activity. To achieve these objectives, it is important that the FWAS understand the opportunities and constraints members face in establishing viable sustainable economic operations.

Woodlots in Saskatchewan are dominated by aspen; private lands account for ~9% of the provincial aspen resource. The principle existing 'traditional' markets for private lands aspen fibre are the existing pulp and paper facility at Prince Albert and a soon to be operating pulp mill in Meadow Lake. Most of the fibre required by these facilities are located on Crown forest lands; licence agreements between governments and the large industrial operations provide various incentives for those industries to harvest and manage the crown forest resources opposed to engaging in substantial private lands wood purchase programs. The large forest companies do not manage the forest as a profit centre separate from the mill complex, but as part of the whole operation; it may be implied that the forest exists as a cost centre to the profitability of the industry. The Forest Management Licence Agreements between industry and government serve as the mechanism through which government regulates forest management activities practiced by industry. Industry has capitalized on economy of scale in forest harvesting to minimize the price of wood fibre. Contractors realize profit for their harvesting efficiency and the cost of forest management is considered additive to this expense. Small woodlot operators are paid a competitive price for the harvesting component of their operations, but must absorb the cost of management against any profits earned. For the most part, woodlot operations are small and managers find it difficult to realize substantial return on investment. In addition, the government provides services of inventory and protection on the FMLA land base which far exceeds revenues received for wood harvest: this may therefore be considered a subsidy to industry for these services. Woodlot managers do not receive comparable benefits. Other factors including agricultural subsidies which encourage cultivation of the private land base tend to compete with the goal of maintaining private lands forests.

Economic analysis of a mixed farm woodlot operation, stand alone woodlot operation and a value-added woodlot operation were conducted to assess the viability of woodlots as economic options. Value-added woodlot management was considered the most attractive of these options but was highly dependent on the management of a large woodlot (>800 acres) which supported a quality mixedwood forest; only a small percentage of all the private forest lands in Saskatchewan would meet these criteria.

The identification of other alternative economic opportunities were identified as part of this project including fuelwood, agroforestry and value-added operations. In general, enterprises which provide woodlot operators with low risk 'turn key' ventures were not obvious. The adoption of integrated management operations which may combine fibre management with non-timber operations including mushrooms and berries, paid hunting, game farming, recreational pursuits etc. were considered. Strategies were also forwarded for woodlot managers to consider. It is imperative that the FWAS concentrate on substantially improving membership to increase lobby effectiveness. The development of Group Ventures which combine the resources of woodlot owners to achieve greater economy of scale in operational management and to expand investment opportunities were recommended. It was also suggested that governments should provide woodlot operations with greater access to the agricultural and provincial forest crown land bases which have high potential as value-added operations.

1.0 INTRODUCTION

Forest resource analysts are predicting that global wood fibre demand, coupled with declining availability of supply, will result in a global wood shortage in the coming decades. Boulding (1986) concluded that 'it is clear that the global forest will increasingly come under demographic pressures both for industrial and non-industrial goods and services', while others have concluded that if global forest resources decline, then it follows that the forest resource in Saskatchewan will become a more important provincial economic resource.

The perception that wood supplies from provincial forests is tightening is a widely shared view amongst Canadian foresters, and is particularly prevalent in this province where 97% of those surveyed voiced concerns regarding growing scarcity (Forestry Canada 1990). Future availability of economically accessible softwood timber is a major concern in most provinces, and has prompted growing interest in the use of hardwoods (including aspen poplar, balsam poplar and black cottonwood) throughout Canada. Two provinces, Ontario and Alberta, lead the way in development of this resource; both are well-endowed in hardwood supplies, and together account for roughly one-half of the Canadian poplar growing stock (Ondro 1988). Despite the relative abundance of hardwoods in these provinces, and consequently, greater pressures and incentives to develop the resource, both provinces are experiencing difficulties developing and marketing wood products, other than pulp and strand boards, from these fibres. However, technological innovations in the use of aspen fibre are occurring throughout North America, and these are expected to present new opportunities for future timber utilization, and to create rapid changes in demands for these timber supplies.

An additional factor which will undoubtedly impact availability of fibre in Canada from crown lands is the growing demands from Canadian citizens that non-timber values be given greater consideration in forest management planning and that ecosystem sustainability be the guiding principle of such efforts. These include such resources as fisheries, wildlife, heritage, recreation and cultural which may be expected to result in greater efforts to maintain forest cover type diversity. The full extent of the impact of 'integrated forest resource management' has not been determined, but it is generally believed that modifications to the long run sustained

yield formulas will reduce the overall annual allowable cuts that currently exist. Forest companies will be forced to intensify operations on their land base and/or seek fibre resources elsewhere. These rapid changes in supply may dramatically impact upon the private wood marketplace.

This report examines the potential for Saskatchewan's private forest enterprises to contribute in a financially beneficial manner to existing and projected demands for timber in the foreseeable future, and examines some alternatives to this conventional use of the forest resource.

2.0 OBJECTIVES

The Farm Woodlot Association of Saskatchewan (FWAS) was founded in 1989 with the following goals:

- to create a forum for communication amongst woodlot owners;
- to ensure that farm woodlot owners receive a fair price for their product;
- to develop the productive potential of private forests;
- to inform and educate the public about the value of the private forest sector and the need for public investment in woodlot development;
- to develop new markets for wood fibre, berries, wild mushrooms and other products of woodlot management;
- to facilitate education and training in woodlot related activities for its members, and
- to encourage other landowners to develop managed woodlots.

In 1991, TAEM was retained by the Farm Woodlot Association of Saskatchewan to prepare a document to assess the potential of private forest operations to contribute to farm income stability and diversification. To achieve this, an examination of current and future markets affecting wood supply and demand in Saskatchewan, an analysis of the economic feasibility of private land forestry, and, identification of existing constraints affecting the potential for development of this resource were necessary. The specific goals that were identified under the terms of reference for this project included:

- identifying market opportunities and constraints for utilization of primary wood products from private lands in Saskatchewan;
- conducting an economic analysis of the costs and return on investment relating to woodlot operations, and
- assessing the effects of different organizational structures on woodlot viability.

In addition to the above, TAEM was also requested to examine other non-fibre resources by which private land woodlot operators could diversify activities to enhance net earnings and stabilize income.

2.1 APPROACH

The study was comprised of several distinct components:

1). Literature Review

The literature review provided a generic overview of history and trends in the industrial forest sector, and in the management of private forest resources. Areas of examination included:

- review of forecasts for the demand and supply of forest products on both the global and local scenes;
- review of the production costs and market values of traditional and non-traditional wood fibre products;
- an overview of the opportunities for value-added wood products, and;
- constraints and incentives to private land forestry.

A summary of the major reports reviewed is included in Appendix A. The significance of these findings, as they relate to the Saskatchewan private forest sector, is addressed within the body of this report.

2). Consultation

Input from different interest groups was sought through the following mechanisms:

- Public Meetings;
- Questionnaire; and
- Personal Interview.

Public meetings were held in April 1991 in the towns of Rapid View, Canwood, Livelong, Prince Albert, Nipawin and Preeceville. These meetings provided a forum for Woodlot Association members and interested parties to share information and discuss issues of concern with regards to current and future woodlot management practices. Meetings were not well attended, although those who came were generally interested in woodlot management and were particularly interested in learning more about the opportunities and economics of private land forestry and agro-forestry.

Approximately one-half of the Woodlot Association membership received mail-out questionnaires in early June. Questionnaires were designed to survey woodlot owner attitudes and forest management practices. The low return rate (21 responses, or 21% of the sample) is not considered atypical for this type of survey; however, the fact that landowners have been inundated with numerous forms and questionnaires related to various aspects of farm management may have further affected landowner willingness to respond. Appendix B presents a summary of woodlot owner responses to these surveys.

3). Economic Analysis and Market Assessment

Data for this portion of the study came from:

- personal and telephone interviews,
- questionnaires, and
- literature review.

In order to understand the economics of woodlot operations and to identify existing marketing opportunities, personal interviews were held with selected members of the FWAS; in addition, several members received a detailed financial questionnaire (see Appendix B). Industry professionals in government and both the private and public sectors were contacted to gain further insight into wood fibre market opportunities and constraints in this province.

Considerable emphasis was placed on the collection of data to support the economic models. This necessitated direct consultation with members of the Farm Woodlot Association; these visits provided a cross-section of the types of woodlot operations in Saskatchewan, and provided the basis on which the modeling scenarios were developed.

Further details regarding the approach to the economic analysis are presented in Sections 4.3.2 and 4.4.2.

3.0 BACKGROUND INFORMATION

Saskatchewan has an area of 65.2 million ha (= 162 million acres), of which 29.9 million ha (77.5 million acres) or 46% is forest land. Approximately 15.9 million ha of the forested area is considered productive for commercial purposes (Giles 1985); however, for reasons of timber quality and accessibility, only 6.5 million ha (16.8 million acres) is considered commercially available at this time (Steele *et al.* 1985). Of the commercially available forest resource, 88% is owned by the province; harvesting privileges are transferred to the private sector through a forest land tenure system that confers harvesting rights in return for certain management obligations and for payment of crown timber dues. Allocation to producers occurs in one of four basic ways (Giles 1985):

- Forest Management Licencing Agreements(FMLA's). Long-term (= 20 year) operating agreements that may be negotiated with large individual forest industry companies;
- Timber Permits. A means of allocating timber to a wide range of different forest operations for a period of 1 year;

- Forest Product Field Permits. The principal means of allocating small volumes of timber to individuals, essentially for their own use; and
- Term Cutting Agreements. These negotiated agreements guarantee a longer-term timber permit for up to a maximum of 10 years.

The remaining 12% of the province's forest resource belongs to the federal government (3%), and private landowners (9%) (Harding 1989).

Commercially important forest stands are distributed throughout the northwest- to southeast-trending mixedwood section of the southern boreal ecoregion (Figure 1) Almost all of this ecoregion is allocated as provincial forest reserve (i.e. the Commercial Forest Zone); south of Prince Albert a small portion of the southern boreal ecoregion extends in the Rural Forest Zone (Figure 2). The Commercial Forest Zone, is characterized by the presence of mixedwoods; forest composition is almost equally divided between softwood (including white and black spruce, jack pine, balsam fir and tamarack) and hardwood (aspen, balsam poplar, white birch, green ash, Manitoba maple and white elm) species (SPRR 1986); further south the volume of softwoods decreases, and hardwoods become increasingly dominant.

Based on a 90-year rotation period, commercially available timber from provincial crown lands provides an annual harvest volume schedule of approximately 6.98 million m^3 (Steele *et al.* 1985); this is approximately twice the volume that is presently harvested (A. Atkinson, Forestry Branch, pers. comm.). Although some regional deficits occur, on a province-wide basis a surplus exists for both softwoods and hardwoods. In 1985, provincial surpluses were estimated at approximately 1.6 million m^3 for softwoods, and 2.3 million m^3 for hardwoods, respectively. However, significant portions of these surpluses are considered economically inoperable due to poor market conditions (Steele *et al.* 1985). Major impediments to the development of Saskatchewan's forest industry include:

- lack of access (transportation networks are limited in the north-central and north-west portions of the province, i.e.. Reserve Supply Area No. 1 & Turnor Lake, where some of the best timber resources are located; hence, haulage costs are significant);
- small tree diameters;
- low volumes per hectare;

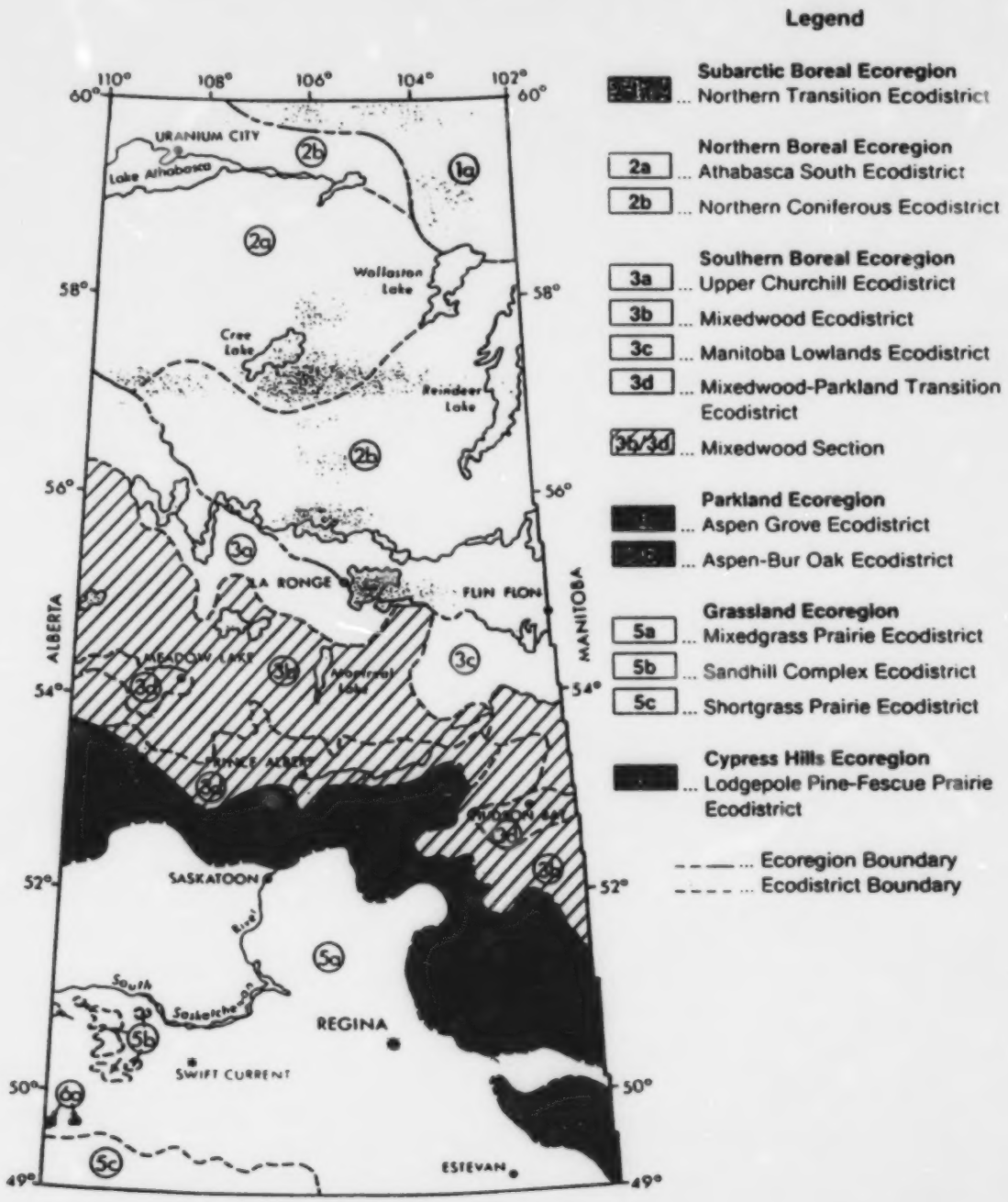

Figure 1. Ecoregions of Saskatchewan and location of the Mixedwood Section of the Southern Boreal Forest (source: SPRR 1986).

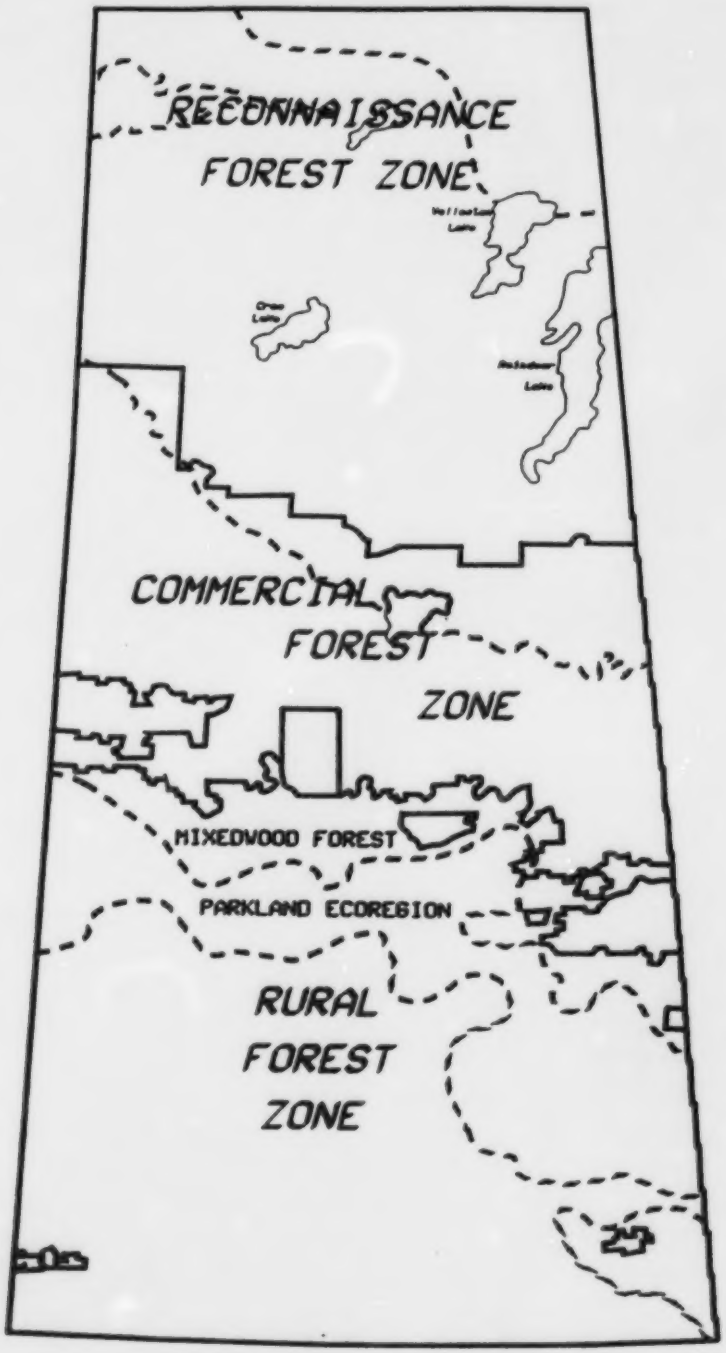

Figure 2. Saskatchewan Forest Zonation and Ecosystem Boundaries

- unsuitable tree species, and
- small stand areas.

Regional deficits of softwoods occur in the Prince Albert, Hudson Bay and L&M Supply Areas. The L&M Supply Area is also considered hardwood-poor (Steele *et al.* 1985; see Figure 3), and hardwood resources in the Hudson Bay Supply Area are close to being fully allocated.

As a nation, Canada's position as a world forestry industry is threatened by competition from the developing countries: high productivity of the land base, coupled with lower labour costs, is putting these countries in an increasingly favourable position. In addition, plantation forests in countries such as Chile and New Zealand are expected to further erode demands for Canadian lumber (Woodbridge, Reed and Assoc. 1988). On the positive side, substantial natural forest resources combined with a stable social and political environment favour Canada as a reliable supplier of high quality fibre products. Within Canada, Saskatchewan's forestry sector functions at average to below-average levels with respect to labour and capital productivity for the following reasons (Steele *et al.* 1985):

- high manufacturing costs (fuel, electricity, materials and supplies);
- high labour costs (wages and salaries);
- high transportation costs (long distance to markets);
- emphasis on low-value products (pulpwood and small diameter logs);
- dependence on older harvesting technologies, and
- generally small scale of operations.

In recognition of these limitations, an increasing number of industry analysts are recommending that industry shift from primary wood fibre production towards greater production of value-added commodities and new, innovative combinations of wood fibre and wood combined with other materials (Woodbridge, Reed and Assoc. 1988). In response, the lumber industry is expected to either develop larger or more efficient plants for the the production of a limited range of commodity goods, or will place greater emphasis on small specialty operations focusing on

niche markets. In general, these new industries are developing slowly, and Canada's forest sector continues to operate in traditional ways.

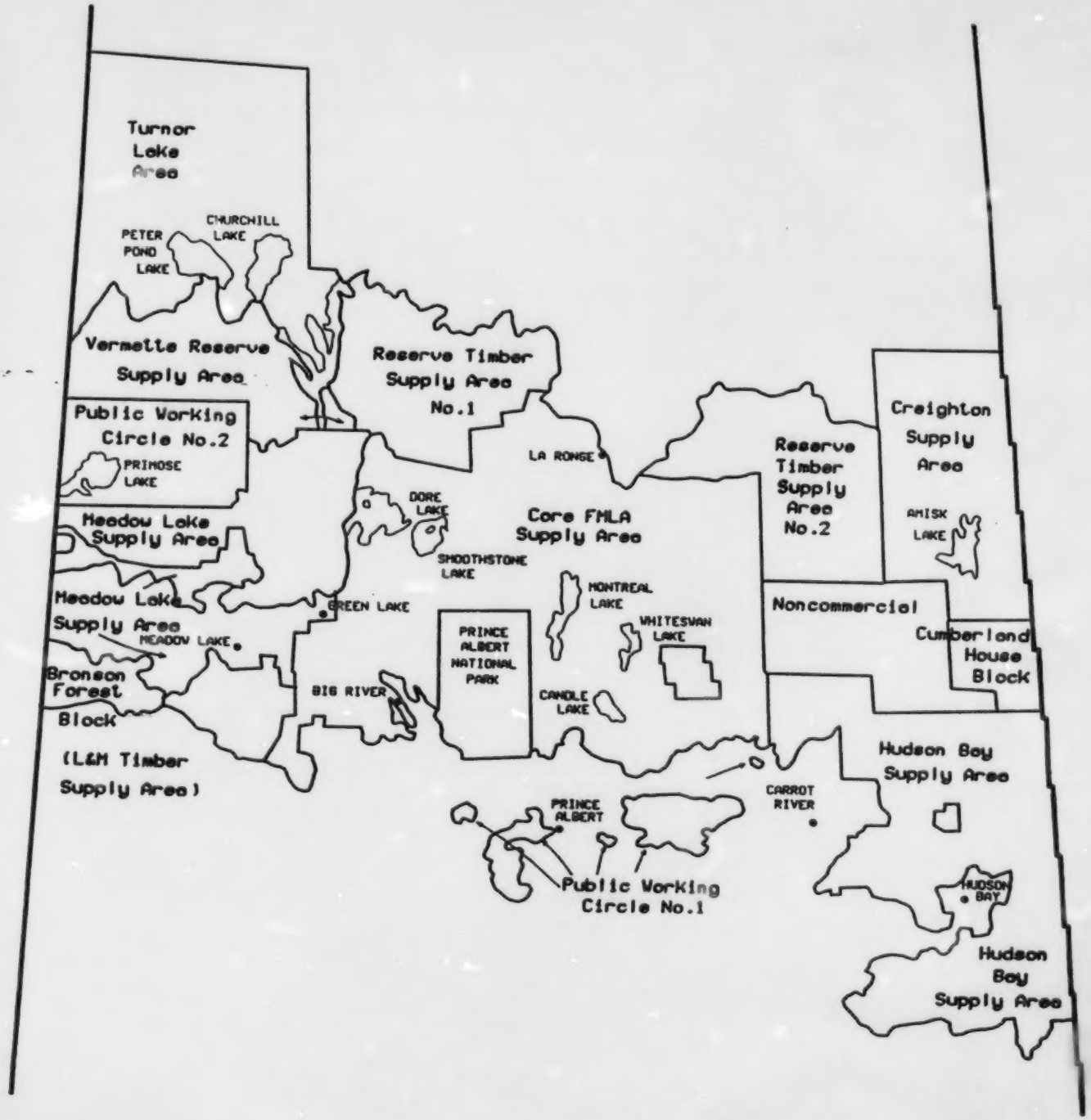

Figure 3. Timber Supply Areas within the Commercial Forest Zone
(from Steele *et al* 1985)

3.1 History of Saskatchewan Forest Industry

The utilization of Saskatchewan's forests has been closely related to, and influenced by, the historical aspects of the forest industry, changes in administrative control and forest product market developments. Commercial forest utilization can be traced back to 1870 when the Dominion of Canada acquired the responsibility of resource administration from the Hudson's Bay Company. Prime virgin stands of overmature white spruce attracted wood industries, and six large stationary sawmills were established. As these blocks were depleted the large stationary mills were replaced by small portable mills which could be moved to smaller, scattered stands of desirable timber. Between 300 and 500 such mills went into operation, and until about 1955, selective cutting in small patches of trees over 36 cm (dbh) was a common practice (SPRR 1986). Today, approximately 70 communities across central Saskatchewan are considered forestry dependent; direct employment in the forest sector typically involves about 10% of the population in these communities, and exceeds 25% of the population in some towns (e.g. Choiceland, Meath Park, Hudson Bay and Big River) (Steele *et al.* 1985).

Currently there are thirteen Timber Supply Areas providing timber to Saskatchewan's publicly-owned mills and large private corporations. Within the provincial forest, total volumes of softwoods and hardwoods is nearly identical, at 196 million m^3 and 206 million m^3, respectively; however, softwood utilization (about 2 million m^3 per annum or 49.8 % of current annual increment) vastly exceeded hardwood utilization (604 000 m^3 or 10.3% of current annual increment) in 1985 (SPRR 1986). The bulk of the timber used by these industries has, until recently, been softwood species, except in the Hudson Bay Timber Supply Area (Figure 3), in which MacMillan Bloedel Industries Ltd. operates a waferboard mill using predominantly hardwood fibre. Recent trends have been to dramatically increase hardwood utilization. Weyerhaeuser Canada Ltd. (WCL) began using hardwoods in their pulping operation in 1985; approximately 40% of the pulp mill operation will depend on hardwoods by 1992 (WCL 1989) with a 20 year average projection for a need of ≈ 734 000 m^3/year. The new CTMP (chemi-thermo mechanical pulp) mill under construction at Meadow Lake and scheduled to begin operation in February 1992 will consume an additional 576 000 m^3/year by 1992-

93 with a long-term projected requirement of 720 000m^3/year beginning in 1994-95.

The implications of provincial wood fibre availability and utilization are discussed with respect to Saskatchewan's private forest owners in Section 5.2 and 5.4.

3.2 CURRENT STATUS OF SASKATCHEWAN FOREST INDUSTRY

Timber harvested from Saskatchewan's Provincial Crown Lands totalled 3.3 million m^3 in 1989-90, with an estimated value of $366 million (SPRR 1990). Disposition of the wood resource was as follows:

- production of pulpwood, plywood bolts and waferboard (58%);
- sawtimber (35%);
- posts, poles, rails and ties (5%);
- fuelwood (2%); and

Wood fibre is processed in a number of mills and plants throughout the province (Figure 4; Table 1). Sawmills of varying capacity make up the bulk of these industries, representing roughly 95% of the province's primary wood users. Three of Saskatchewan's existing or new large-capacity forest industries utilize both softwood and hardwoods (MacMillan-Bloedel, WCL and Millar-Western): these three operations will consume ≈ 2 million m^3/year. The major softwood consumption is used by existing sawmills in Big River, Meadow Lake and Carrot River and the plywood mill in Hudson Bay.

Table 2 summarizes species' utilization by industry, and highlights the importance of white spruce and jack pine to most of the forest sector. This dependence on softwood fibres by traditional wood-using industries has significant implications for woodlot operations in the province; these implications are discussed further in Section 5.2.

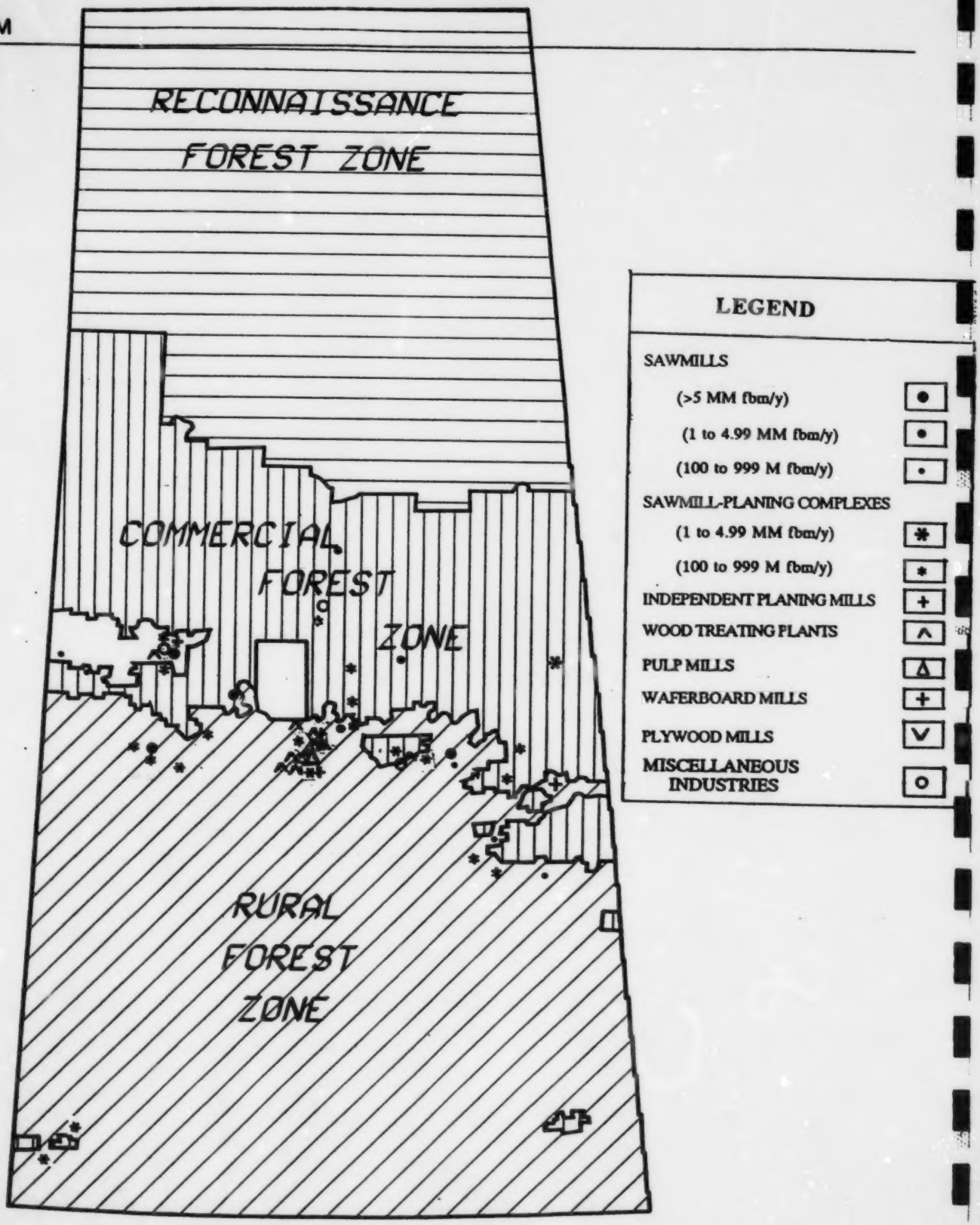

Figure 4. Composite Map showing Locations of Major Industrial Mills and Plants

Farm Woodlot Association of Saskatchewan
'Saskatchewan's Private Forest Resources'

Table 1. Number of mills per district by mill type and capacity

	No. of firms	Direct employment (person-years)	Indirect employment (person-years)	Total employment (person years)	Employment multiplier[a]
Primary Industry[b]					
Sawmills					
Greater than 8115 m^3 (>5 MM fbm)	6	874	1576	2450	2.803
1623-8115 m^3 (1 MM to 5 MM fbm)	4	53	96	149	2.803
162-1623 m^3 (100 M to 1 MM fbm)	34	78	141	219	2.803
Less than 162 m^3 (<100 M fbm)	116	22	40	62	2.803
Independent planing mills	2	12	22	34	2.803
Plywood	1	164	150	314	1.912
Wood treating	12	289	264	553	1.912
Miscellaneous wood-using industries (building timber, lath)	3	5	5	10	1.912
Pulp and paper	1	773	1772	2545	3.293
Waferboard	1	211	192	403	1.912
Independent log producers	n/a	275	117	392	1.424
Total		**2756**	**4375**	**7131**	**2.587**
Secondary Industry[c]					
Sash door, and other millwork industries (SIC[d] 254)	40	317[e]	176	493	1.555
Wooden box and pallet industry (SIC 256)	1	2[e]	1	3	1.530
Paper box and bag industries (SIC 273)	2	110[e]	81	191	1.734
Other converted paper products industries (SIC 279)	2	50[e]	36	86	1.713
Total		**479**	**294**	**773**	**1.614**
All forest Industry		**3235**	**4669**	**7904**	**2.443**

[a] The multipliers used in this table are derived from the Manitoba Bureau of Statistics and are presented as weighted averages to reflect the forest industry classification system used in this report

[b] Primary industry statistics are from the Canadian Forestry Service

[c] Secondary industry statistics are from Statistics Canada

[d] Standard Industrial Classification

[e] Estimate

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Forest exports, comprised primarily of wood pulp (52%) and other paper and paperboard (37%), contribute an estimated $275 million to the provincial economy. At present, the United States consumes an estimated 79% of our forest products, while another 18% of our exports goes to Japan (Forestry Canada 1990a); no new large international markets are currently being targeted. Wood products are supplied by 143 large- and small-scale logging companies, 65 wood industries and 6 paper and allied industries, and together account for 1 job in 56 in the province (Forestry Canada 1990a).

Table 2. Percent Wood Species Utilization by Industry. (Numbers in parentheses indicate median values)

	Percent	Softwood	Utilized	Percent	Hardwood	Utilized
	jP	wS	Other	tA	bPo	wB
Sawmills >5MM fbm	10-90	10-90	1-5	0	0	0
Sawmills 1-4.99MM fbm	0-90	10-100	0	0	0	0
Sawmills 100-999 M fbm	10-100 (38)	10-100 (90)	5-24	0	0	0
Independent Planing Mills	10-50	50-90	0	0	0	0
Wood treatment plants	20-100 (95)	0-80 (0)	0-10 (0)	0	0	0
Pulp mill (P.A.)	22	34	3	38	2	<1
Plywood mill (Hudson Bay)	0	95	0	5	0	0
Waferboard mill (Hudson Bay)	0	0	0	86	14	0
Miscellaneous Wood Users						
• P.A. Building Timber	0	0	0	100	0	0
• Uncle Tom Log Cabins	0	5	0	95	0	0
• Northern Lath	100	0	0	0	0	0

While Saskatchewan's forest industry contributes to the stability and diversity of a provincial economy dominated by agriculture and mining, concern has been expressed that the industry's high manufacturing and transportation costs and low productivity could jeopardize its future (PAIF 1990). Several other factors have

also been identified as limitations to the expansion and future operation of Saskatchewan's forest sector; in order of decreasing frequency of citation the following factors have been identified by industry professionals (Giles 1985):

- wood supply;
- market fluctuations;
- lack of market development;
- access to merchantable timber;
- distance from market;
- wood quality issues;
- lack of investment capital, and
- labour shortage.

The maintenance of the industry's competitive edge may depend on the modernization of equipment, and on the manufacture of higher value added products (PAIF 1990). This need to shift from traditional primary wood fibre production towards greater production of value-added products is a resounding theme throughout the literature (see for example Ondro 1991, 1988; and Wengert 1988).

4.0 METHODS

4.1 PRIVATE WOODLOT RESOURCE INVENTORY

Details regarding the the distribution and size of Saskatchewan's private woodlot resource were extracted from Harding (1989; Appendix C) who used satellite imagery and land tenure maps to identify forest cover types on private deeded land throughout central Saskatchewan. This information was supplemented through a literature review of assorted government documents. Individual members of the FWAS provided additional detail regarding the size, species presence, and relative quality of their woodlot resource.

4.1.1 Volume Availability

Harding (1989) used an empirical formula to calculate the potential volume of fibre available from private forest resources. This formula took into account

characteristics such as height and age class information for all timber stands sampled; height/diameter curves were then developed and a stand-table factor applied to obtain stand volume per hectare. His analysis represents the best available data on private forest resources at this time.

Projected timber volumes from private land are presented in Section 5.1.1.

4.1.2 Species Availability

Information pertaining to the forest inventory on private lands came primarily from Harding (1989). Government documents provided additional details regarding forest species' distribution across the province; this was further supplemented by information provided by those FWAS members who responded to the survey that was sent out in May 1991. Results of these analyses are discussed in Section 5.1.2.

4.1.3 Quality Assessment

The assessment of wood fibre quality from private lands was limited to a search of existing documents and subjective comments from FWAS members with respect to their own lands. Results are discussed in Section 5.1.3.

4.2 Literature Review

Literature was sourced from around the globe, but the greatest emphasis was placed on material relevant to the Canadian scene. Where possible, information relevant to the Prairie provinces, and to Saskatchewan in particular, was summarized. The literature review has been broken down into three major areas of concentration, to reflect the major components of this project, including:

- product marketability and market values;
- economics of production, and
- constraints to initial development

Major findings gleaned from individual reports are presented in Appendix A. This information has been reviewed and interpreted with respect to Saskatchewan's

private forest sector; the inferences drawn from these reports are referred to throughout Section 5 (Results), and provide justification and support for the assumptions made in the economics and marketing sections, and for the conclusions presented in this report.

4.3 Consultation with Industry and Government

Consultation with industry experts included telephone interviews and in-person meetings. In addition, a number of individuals were contacted with regards to identifying alternative means to diversify incomes from woodlots, and to assess the financial feasibility of these options.

4.3.1 Constraints to Initial Development

Physical, social and political factors were expected to constrain woodlot operations from achieving economic independence. Some of these factors were specifically identified by woodlot owners during the administration of the Woodlot Owner Survey; others were identified through literature review, and through consultation with industry and government officials. Factors which act as disincentives to successful woodlot operation are discussed in Section 5.2; Section 7.0 suggests some proactive measures the Farm Woodlot Association of Saskatchewan might pursue to overcome these some of these restrictions.

4.3.2 Economics of Production

The objective of the economic analysis is to assess the financial feasibility of private woodlot operations in Saskatchewan. To accommodate the range of possible operations, a *Computerized Business Planning Model* was constructed specifically to fit a grain farming and woodlot operation (either separately or integrated). A literature review of past studies that have been done in British Columbia, Alberta, Quebec and Saskatchewan provided economic and financial data on which to base the analyses; in addition, interviews were conducted with individual woodlot owners and operators in Saskatchewan. The planning model allows us to assess the economic potential of various woodlot operations, by inserting the appropriate cost and revenue data.

The Business Planning Model and its input requirements are described in greater detail in Sections 4.4.2 and 4.4.3; results of the analyses are presented in Section 5.3.

4.3.3 Product Marketability and Market Values

Markets for traditional and non-traditional wood fibre products were determined primarily from literature review, and through consultation with industry and government experts. Members of the FWAS shared their experiences with marketing their forest resource, and identified a number of unconventional or alternative uses for wood fibre. These individuals also provided information regarding the economics of production of wood from their private forests; other sources in the literature were also sourced.

Marketing issues are discussed in detail in Section 5.4.

4.4 DATA ANALYSIS

4.4.1 Constraints to Initial Development

The factors which act to constrain woodlot owners from realizing a reasonable economic return from their forest resource were identified through consultation and literature review. Government and industry personnel provided insight into provincial policies and legislation; in addition, surveyed members of the FWAS identified relevant factors which influenced their management decisions with regards to use of their resource.

The impacts of provincial policies and legislation on woodlot viability are presented in Section 5.2. For comparative purposes, an overview of some of the programs, policies and legislation employed in other provinces is also presented.

4.4.2 Economics of Production

The economics of wood production from private land was evaluated using a computer model that was specially tailored to the needs of this industry. The Farm-Woodlot Planning Model is an integrated grain farm and woodlot computerized financial model, which projects income statements, balance sheets and cash flows

based on estimates of revenues and cost data. The model requests input for a grain farm operation as well as a woodlot enterprise, but can be run with either grain farm input only or woodlot input only.

Input requirements include the following:

- Economic variables such as the expected inflation rate, operating loan rate and long-term debt rate, short term investment rate and the cost of capital
- Land purchases, sales and yearly land inventory
- Opening balance sheet
- Capital cost allowance information
- Expected grain crop rotation on cultivated acres
- Expected grain yields
- Expected grain prices
- All grain crop operating expenses including seed, fertilizer, herbicides and pesticides, fuel and oil, insurance, repair and maintenance, etc.
- Expected amount of debt financing
- Expected amount of equity financing
- Working capital requirements
- Expected quantity of woodlot sales by category, ie., logs, firewood, woodchips, etc.
- Expected selling prices for each category of harvested wood or value added product
- Direct logging costs such as stumpage fees, felling and bucking, yarding and shedding, transportation, hired labour, etc.
- Indirect logging costs such as lease payments, property taxes, insurance, accounting, etc.
- Forest management costs such as engineering, planning, inventory, etc.
- Silviculture costs including planting, surveying, spacing, weeding, etc.
- Woodlot capital costs such as roads, logging equipment, trucks, buildings, etc.

Each of these inputs must be provided, usually in the form of a cost per acre or cost per cubic metre. The model organizes the data to provide a financial output.

The output of the model is a financial summary of the enterprise being represented. The summarized output includes the following:

- Projected Income Statements (include grain farm and woodlot revenue, total expenses and projected net earnings or loss)
- Projected Balance Sheets (include an annual projection of assets, liabilities and net worth for the enterprise)
- Projected Cash Flow (includes all expected cash inflows and outflows each year to arrive at expected net cash flow after tax each year).
- Financial Rate Analyses (includes calculations for the following key ratios):
  - return on equity
  - return on total assets
  - gross profit margin
  - net profit margin
  - debt to total assets ratio

The economic and financial performance of three likely types of woodlot operations were modelled and analysed. These scenarios included:

- one in which a grain farmer has some woodlot available and decides to harvest either selectively or clear cut (Scenario # 1);
- a stand alone woodlot is operated mainly for sale of pulpwood (Scenario # 2), and
- the woodlot owner harvests the raw product and then adds value before selling (Scenario # 3).

Specific examples of these types of operations, and their respective economic and financial feasibility, are described in Section 5.3 of this report. It must be appreciated that input variables were based on information obtained from woodlot owners across the province. The range of potential analyses based on adjusting any

single component is almost limitless; the values selected reflect the ones the authors believed represented the 'best' averages.

The inputs (expected revenues and costs) on which these models were based are included in Appendix D; readers of the document are requested to review the assumptions respecting all inputs. A complete printout of the model appears in Appendix E.

4.4.3 Product Marketability and Market Values

Markets for Saskatchewan's wood fibre were identified through literature review and consultation with industry professionals. In addition, a number of business associations were contacted in order to identify alternative land-based activities that woodlot owners might wish to consider; the economics of these options was not assessed, although some operators were contacted and informally questioned about their business.

5.0 RESULTS

5.1 PRIVATE WOODLOT RESOURCE INVENTORY

The most recent estimate of the number of woodlots on private land in Saskatchewan is 15 000 (Forestry Canada 1990a). The best estimates of total land area available are attributed to Harding (1989), who concluded that nearly 9% of Saskatchewan's forest resource is privately owned, and is comprised of 579 186 ha of hardwood and 88 338 ha of softwood timber for a total area of approximately 667 524 ha. Hardwoods therefore comprise approximately 85% of the forest species on private land, and contain, on a volumetric basis, approximately one-quarter of Satatchewan's total hardwood resource of 265.2 million m^3. This disproportionate representation of hardwood species on private lands is indicative of significant real differences which exist between the Rural and Commercial Forest Zones. The significance of these findings to woodlot operations are discussed in Section 5.2.3.

Between 1980 and 1985, the number of Saskatchewan farms reporting forest products sales declined by more than half: from 246 in 1980 to 164 in 1985 (Forestry Canada 1990). However, during the same time period, the value of sales from private land forestry increased slightly, from $993 000 to $1 194 000 (Forestry Canada 1990); this increase suggests that remaining operators are managing their woodlots on a more intensive basis, and may be indicative of a shift towards adding greater value to finished products.

5.1.1 Volume Availability

Saskatchewan's non-industrial private forests are distributed throughout the mixedwood forest, but are in general located south of the Commercial Forest Zone which is the primary source of timber to industry. Within the Rural Forest Zone wood volumes and quality are greatest in the regions between Meadow Lake and Prince Albert, and east of Melfort to the Manitoba border; in general, the central region of the Rural Forest Zone is comparatively impoverished (see Figure 5).

Harding (1989) calculated wood volume measurements from private land equal to 59.4 million m^3 and 10.52 million m^3 for hardwood and softwood timber, respectively, for a total volume of just under 70 million m^3 of wood. Long range sustainable yield from these stands was computed to equal approximately 850 000 m^3 for hardwoods, and 117 000 m^3 for softwoods; i.e. hardwoods (deciduous) species would account for 87.9% of the estimated available wood supply from the non-industrial private forest (Harding 1989). TAEM has not conducted independent calculations on supply as part of this report. This relative abundance of hardwoods on private land is further illustrated given that roughly 25% of Saskatchewan's aspen/poplar resource is located on private lands, although these lands themselves contain only 9% of the province's timber resources.

Results of Harding's (1989) volume computations for hardwood and softwood stands in the non-industrial private forest are presented following Figure 5:

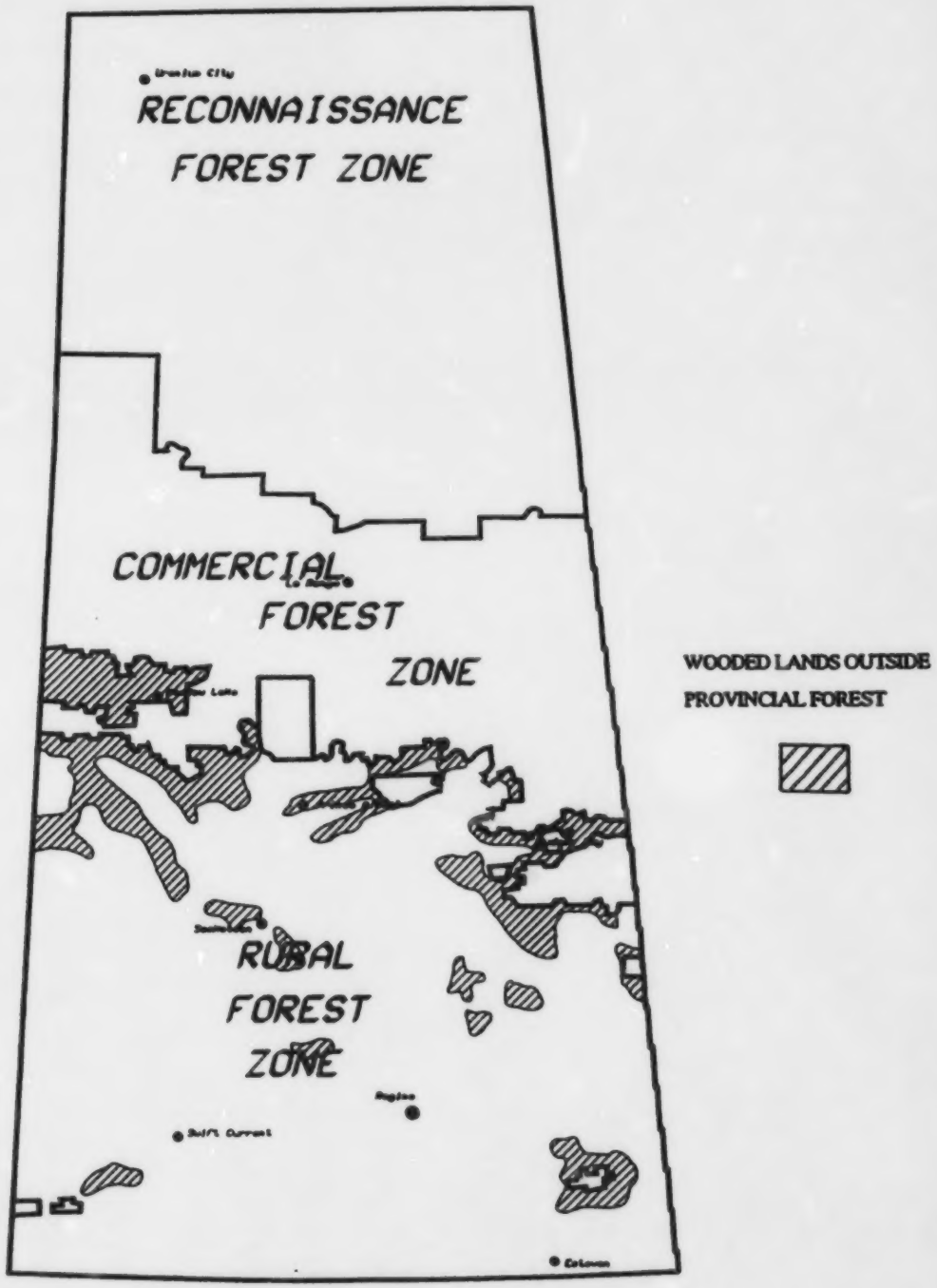

Figure 5. Wood Availability in the Rural Forest Zone (modified from Steele *et al.* 1985)

Non-Industrial Private Forests - Volume Summary

	Volume in thousands of cubic metres, Hardwood	Softwood	Total
Western Region	20 758.4	5 283.4	26 041.8
Central Region	24 642.3	3 442.9	28 085.2
Eastern Region	13 996.1	1 794.7	15 790.8
Saskatchewan	59 366.8	10 520.9	69 887.7

5.1.2 Species Availability

Private land forests are characterized by the presence of mixedwoods. In descending order of importance, the dominant species in the non-industrial private forest are: trembling aspen, white spruce, jack pine and white birch. These resources are distributed inequitably across the province, and are most abundant in the "Central" region north and west of the city of Prince Albert, and scarcest in the eastern sector of the province (i.e. east of Melfort) (Harding 1989). As revealed by the Harding analysis, hardwood species comprise almost 85% of the total timber volume on private lands, and represent about one-quarter of of the total provincial hardwood resource.

Despite the relative abundance of hardwoods on private land in Saskatchewan, utilization is relatively low at present. Dramatic actual and projected increases in large mill requirements for the hardwood fibre may lead to increased future demands from private lands.

5.1.3 Quality Assessment

Timber quality from private forest resources in Saskatchewan is not well known. Comments provided by the FWAS survey respondents suggest that wood quality on private land ranges from "very good" to "very poor", but due to the subjectivity of these responses, it is not possible to develop a regional picture of fibre quality throughout the non-industrial private forest. Harding (1989) provides some generic comments in reference to wood quality throughout broad regions of the province, but this assessment is again subjective in nature. To date, little effort has been expended to assess the quality and quantity of wood resources on private land,

although there are some indications that future inventory efforts may include private land (pers. comm. SPRR)

5.2 Constraints and Incentives to Initial Development

In Canada, most forest land is provincial crown (>80%) or privately owned (<20%); notable exceptions in the ratio include Nova Scotia (73% private woodlots), New Brunswick (53% private woodlots) and PEI (100% private woodlots). In general, commercial crown timber resources are managed through Forest Management Licence Agreements (FMLA's) which are legal documents signed between large industry and provincial governments for access and utilization of timber resources on provincial crown lands. Industry gains a right of access to the timber in exchange for a fee generally based on volumes of timber harvested or stumpage. The agreements tend to be long-term (>20 years) and vary within and between provinces respecting the financial terms and obligations to forest management and renewal. For the most part, provincial managers have participated in a competitive inter-provincial process of attracting industry to locate within their jurisdictions by using the powers of financial incentives; these include access to relatively 'low cost' wood fibre. Economic benefits accruing from associated capital investment combined with job creation are frequently cited as the measure of provincial economic success.

Industry, whether small or large, desires to obtain wood for the lowest possible cost to minimize the cost of primary inputs. In most provinces, the private woodlot resource is dwarfed by the size of crown land holdings, and may be viewed by provincial economic managers as a sector more difficult to organize or motivate to invest in timber management ie. substantially more time and effort may be required; as a result, government economic policies have historically tended to favour large industrial complexes over small operators. These events, combined with an underdeveloped small woodlot value-added products and marketing industry, have resulted in a wood fibre marketplace characterized by many primary wood producers (woodlot owners) and few buyers (industrial mills). Woodlands operations of large FMLA holders are managed as a cost centre to the profitability of the mills compared to the private woodlot owners (exclusive of value-added products operations) who must operate their woodlots as their only profit centre.

This situation tends to diminish raw material prices where supplies exceed demand. In essence, many provinces have created a situation where it is competing for market share with its own citizens; unfortunately, these frequently results in an atmosphere of confrontation between the private woodlot owners and large industry when in reality, it is often government policy, not industry who are responsible for the conflict.

The evolution of these circumstances is more a statement of fact, opposed to what woodlot owners may perceive to be a concerted effort on behalf of large industry to exploit the small woodlot producers. Industry was enticed to commit investment dollars to the construction of large mill complexes and, in return, given long term access to a stable and relatively low cost wood supply. The emergence and organization of the private woodlot sector in Canada has clearly illustrated that, within this environment, small producers have difficulty in gaining fair market opportunity. In addition, the Licence Agreements between industry and government, generally provide direct or indirect incentives for industry to focus activities within the crown-land base by the inclusion of 'use it or lose it' clauses; industry must strive to harvest the annual allowable cuts or risk the province's power to allocate the surpluses to competitors; large industry generally want to maintain their forest land base as security for the large capital investment in the mills.

Understanding the nature of the current problem should not be difficult, but solutions appear to be most complex particularly from a social and political perspective. The historical use of subsidies and incentives as a means to attract large corporations to inject investment dollars into the respective provincial economies cannot be easily rectified. The obvious solution would be to adhere to a free market system whereby users would openly compete for crown wood supplies to ensure that the marketplace determined the value of wood, but adoption of this approach could spell economic chaos unless all jurisdictions in Canada followed a coordinated approach; even so, stability could not be achieved without severe local or regional impacts.

In the absence of a coordinated commitment to free market principles, governments are faced with a substantial dilemma of 'whether or not' and 'how to' manipulate

the marketplace or players therein in an attempt to assure that all participants are satisfactorily rewarded. Section 5.2.1 presents a summary of some of the policy options that have been pursued by the provinces in their attempts to 'level the playing field'.

5.2.1 Government and Industry Policies and Legislation

5.2.1.1 Saskatchewan

Saskatchewan Parks and Renewable Resources has few explicit written policies regarding the supply or disposition of forest resources in the province, and currently has *no* policies with regards to timber supplies on private land. (Murray Little, pers. comm.). The *Forest Act* documents rules and regulations specific to Crown timber, and specifies the mechanisms by which timber can be allocated to various users. The Act permits the Lieutenant Governor of Canada to set the regulations and orders respecting management and disposition of the resource, and to set such fees as the rates of dues for Crown timber and other forest products, tariffs for management licences, timber permits and timber sales.

Fees collected by the province in royalties fall vastly short of the total amount expended on the public forest. Annual expenditures amounted to approximately $40 million in 1990, which included approximately $8.9 million for silviculture, inventory, forest development and regional operations; a further $32.5 million was spent on fire protection (A. Atkinson, SPRR, pers. comm.). In contrast, approximately $3.3 million was collected in royalties (stumpage) from large industry for the right to harvest approximately 3.3 million m^3 of wood fibre from Crown lands. In essence, this public expenditure equates to a subsidy of over $\$10.50/m^3$ for wood fibre. However, the expense is not without benefits, as the industry does have socioeconomic importance: in 1989-90 the industry provided direct and indirect employment of 2 232 and 3 549 person years respectively (SPRR 1990); this compares to an estimated 3 235 and 4 669 direct and indirect person years in 1985. A total of 17 towns and villages, 5 Rural Municipalities and 9 Indian Reservations were considered "forestry-dependant" in 1985 (Steele *et al.* 1988). In 1985, the Canadian Forestry Service estimated that the forest industry generated $54 million of wages and salaries within the manufacturing sector of

Sask. and an additional $15.6 million from logging activities (Samoil *et al.* 1987). The industry adoption of highly mechanized approaches to forest harvesting and processing generally result in fewer primary jobs, thereby impacting the reducing the direct job benefits. Eighty-five percent of Saskatchewan forest product output is sold outside of the province thereby contributing positively to the province's export income.

Weaknesses also exist with respect to the way that private lands wood fibre is valued in this province. In addition to direct subsidization to forest management through government expenditures that exceed income generated from primary forest harvesting, industry is favoured in that it does not pay a lease fee (and consequently avoids taxation) on the land base harvested. In contrast, woodlot owners incur costs associated with owning the land (taxes, return on capital, investment costs) and must pay fully for all costs associated with management of the resource (i.e. for planning, silviculture and protection). Although the Land Assessment Branch provides a property tax exemption on private forest land, (it allows deductions for a maximum of 10 acres of forest), the savings do not offset the costs of forest management. The net result of these policies is that wood from private land must necessarily be valued higher than the price placed on wood from Crown land.

Differences in pricing structures are further evident when one compares the prices received by private woodlot owners for wood delivered to the mill for pulping (i.e. about $18.82/$m^3$ for hardwoods > 50 km from the mill), versus the price paid by industry for wood plus the associated management inputs from provincial forests. The cost of crown wood incorporates a harvesting and delivery component (~$18/$m^3$), a management component ($7-8/$m^3$) and a protection component ($10/$m^3$) which adds up to $35-37/$m^3$. For industry, their share of the management costs ($6-7/$m^3$ which includes $0.50/$m^3$ for hardwoods and $2.30/$m^3$ for softwoods paid to a provincial trust fund for forest renewal) reflects an obligation to the crown through the FMLA process. For government, their share of management (inventory) and protection ($11/$m^3$) reflects an obligation to industry. Under the current situation, private woodlot operators are expected to include the cost of management and protection from profits on wood sales; industry accounts for management from mill profits which accrue from the value added to processed wood. One can therefore appreciate that the arguments respecting a fair price for

private wood are somewhat complex. If the crown forest were managed as a separate profit centre isolated from the mill complex, the value of the wood delivered to the mill would have to reflect return on investment associated purely with forest harvesting and management; this is not the case through the FMLA process. However, even if the private woodlot owner were to receive an equivalent of $35-37/m^3$, there would is no guarantee at the present time that the woodlot would be managed for the combined objectives of profitability and sustainability.

5.2.1.2 Other Jurisdictions

The value of private timber resources on private lands is explicitly acknowledged in the Forest Acts of Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia. The forest policy of Nova Scotia specifically aims to 'help private landowners make the best use of their forested lands', and makes provisions to guarantee private landowners receive a fair share of the available market at a fair and reasonable return for primary forest products sold. In contrast to Saskatchewan, private woodlot owners in eastern Canada typically receive about $20/m^3$ for mill-delivered hardwood (Rick Christopher, New Brunswick Woodlot Owner's Association, pers. comm.); softwood prices average higher: $22-29/m^3$ for mill-delivered wood, or about $13-17.77 at the roadside (John Robley, Nova Scotia Woodlot Owners Association, pers. comm.). Mill-delivered prices in the U.S. run even higher: $25/m^3$ for jack pine, $31/m^3$ for white spruce, and $17.77/m^3$ for aspen (prices in U.S. dollars) (John Krantz, Minnesota Dept. Natural Resources, pers. comm.).

Except for Manitoba, Saskatchewan and Alberta, all of the provinces have enacted a variety of programs, policies and incentives designed to assist the private woodlot owner. Systems which exempt or reduce private forest land from taxation are common, and many provide additional incentives to manage private forest land: for example, the Managed Forest Tax Reduction Program (Ontario) reduces property taxes by 50% on managed land, and allows property tax exemptions for up to 20 acres of forest land, while Quebec encourages maintenance of tree stand density through "frozen assessments" which hold the tax rate stable for 10-year periods; in addition, Quebec also provides low interest loans to private foresters.

Provincial programs provide landowners with a variety of services, including financial assistance and marketing advice. Forest management programs, training programs, and professional and technical advise are provided in Nova Scotia, New Brunswick, PEI and Quebec. Several provinces recognize private land foresters need assistance with silviculture and protection from fire, insects, disease and competition, and may provide these services through such mechanisms as cost-shared programs (Ontario), or flat-rate taxes on forest land (Newfoundland).

Federally, the Constitution Act (1982) empowers the provinces with powers over property and civil rights; hence, the Minister of Forests may enter into agreements with federal and provincial governments, municipalities and individuals. Federal monies provide direct funding to private forestry, and support research oriented towards small ownerships (e.g. FERIC). Grant monies are usually matched by the provinces, and can be substantial: e.g. the Canada-Nova Scotia Forest Resources Agreement 1982-1989 provided management services to eligible private lands; public financing amounted to $46.1 million over the 7-year period (i.e., about $6.5 million/yr).

In addition to providing incentives to private land forestry, several provinces have enabled landowners to optimize forest productivity through effective land management strategies. In the eastern provinces where woodlots represent the highest proportion of non-crown timber lands, woodlot owners have organized over the last 30 years to protect their interests. In places like Quebec and New Brunswick the inclusion of wood under respective farm products legislation has led to the creation of marketing boards or agencies which were instituted primarily for the purposes of negotiating prices between buyers and sellers. Large industries must reach agreements with the marketing boards respecting price and volume prior to provincial approval to access the crown resource.

In addition, landowner cooperation through such structures as group ventures, has enabled some small-holders to overcome the problems caused by land fragmentation, and to achieve economies of scale in forest production. Such systems work by pooling eligible properties together for forest management purposes; members of the group then share in both the profits and the capital expenses incurred in forest management.

Group venture programs have been most prevalent in Nova Scotia and Quebec. The legitimacy of group ventures as a form of land tenure is recognized within the Nova Scotia Forest Act, and regulations determine landowner rights and responsibilities. Landowners who join a group venture are legally bound to the program for a 10-year period; during that time, members are required to market all wood through the group venture and to pay a management fee valued at 5% of the roadside price of all products sold. Benefits typically received by the group include technical advice, marketing of wood products, and all costs of forest management within limits set out in the guidelines of the subsidy programs; in addition, some groups provide members with employee benefits. In essence, the group venture program provides a method of delivering government funded forestry programs to woodlot owners, i.e. they help to redress the imbalances of government subsidies to public forest companies. On the negative side, the Nova Scotia 'group venture' experience led to a substantial fragmentation of any centralized provincial association creating extreme disarray and competition between groups.

In Quebec, group ventures are free associations of woodlot owners who manage the membership woodlots as a common unit. The goals are to achieve economy of scale and sharing of capital resources with the objective of optimum development and intensive forest management of members' properties. The group buys wood from the owner, and the owner is considered an employee of the group for income purposes such that each is eligible for normal fringe benefits of industrial workers. Each member of a group venture must sign a long-term agreement with the group in return for management plans and services. In essence, each member entrusts his/her assets to the group for the life of the agreement. These groups are recognized by government and are eligible to receive assistance for approved forest management activities. Ties are maintained to the marketing boards in that only one group venture/marketing board unit (51 in total) are eligible for subsidies. Until recently, group ventures had to deal through marketing boards for funding; a change in this program now provides autonomy of group ventures from marketing boards.

As well as addressing issues of economies of scale and fragmentation of land holdings, groups may act as a lobbying organization, or as a bargaining agent to negotiate timber or pulp prices and volumes for delivery to area mills.

5.2.2 Infrastructure

Poor product price has various ramifications for woodlot owners; in particular, they vastly reduce the distance over which wood can be transported to a mill site for even a small amount of profit. While woodlot owners are frequently constrained by distance to the mills, the forestry companies recognize different limitations to what is considered "economically accessible timber", including the productivity of the land, opportunities for renewal, and cost to reforest (Bob Sutton, Weyerhaeuser Canada, pers. comm.). The reduced effect of distance on 'accessibility' is illustrated at Meadow Lake, where wood may be transported in excess of 200 km to the mill (Dave Harmon, pers. comm.). In addition, roads and transportation agreements between industry and government may provide some added incentive for mills to access more remote timber supplies.

The effect of distance to mills is a major constraint to the viability of woodlots, particularly where aspen is the major wood produced. In Saskatchewan and Alberta, wood is usually priced on a mill delivered basis: i.e. hauling and logging costs are subtracted from the delivered price, which has the effect of moving the break-even point to locations close to the industry. The success of Alberta's new oriented strand board and CTMP plants, both of which use aspen fibre, is attributed to the combined facts that both plants are located near Alberta's forest/agricultural land borders (i.e. a transportation infrastructure is in place), and are located relatively close to the private forest land which supplies the plants (Messmer et al. 1990). The new CTMP plant at Meadow Lake is modelled on these principles, and may therefore be a good potential market for private land wood (see Sections 5.4.1 and 7.3.1).

Security of supply and timing of delivery are both factors which influence industry's decision to purchase wood. Weyerheuser Canada purchases a significant proportion (40%) of its incoming wood, although a small fraction of this

(~ 150 000 m^3) comes from private lands. From the industry perspective, the reasons why private wood does not make up more of their volume relates to its higher "costs" in terms of scheduling of incoming loads, format of wood delivery, and more labour-intensive handling requirements (Bob Sutton, Weyerheuser Canada, pers. comm.). Improved efficiency of delivery could therefore make this supply more attractive to industry (see Sections 6 and 7). Low prices may also act as a deterrent to the delivery of more private wood to the mills.

5.2.3 Competing Land Use

In addition to having government and industry policies which effectively exclude woodlot owners from participating in the province's forest industry, some programs and policies in the agricultural sector act further to discourage woodlot management. During the 1970's and early 80's, the Grazing Lease Improvement Program of Sask. Agriculture and Food encouraged land conversion to agriculture by providing direct payouts for felling trees, breaking land, clearing and burning; the problem was exacerbated in the 1980's and early 1990's by policies which encouraged lessees of agricultural crown lands to purchase those lands. Today, tax breaks continue to provide incentives for land conversion (Dave Cubbin, pers. comm.), although these benefits may be slightly offset by programs such as the "Save Our Soils" program, and the Prairie Farm Rehabilitation Association's (PRFA) Permanent Cover Program which provides monetary incentives to grow perennial forage on erodible or marginal lands. There are, however, no provincially-funded programs in this province promoting maintenance of existing forest cover on private land. The federal government has been more active in this regard through its funding of the FRDA agreements, and recently PFRA has provided direct support to the Farm Woodlot Association to produce educational materials.

Other agricultural programs, including GRIP (Gross Revenue Insurance Plan) and NISA (Net Income Stabilization Account), which are joint Federal - Provincial initiatives, provide indirect incentives to clear marginal land for grain production. While GRIP is intended to protect farmers against production losses and price level fluctuations of agricultural crops, payouts are calculated as a function of total

number of seeded acres multiplied by a guaranteed price per acre. Given that the wood on private land has very low value attached to it (landowners typically receive about $2 to 3/cord for wood, about $30-45/acre; Ed Kowal, SPRR, pers. comm.), there is considerable incentive to clear the land and enroll it in Crop Insurance programs that ensure some payback on seeded acreage. Recent estimates that Saskatchewan received > $14 billion in agricultural assistance programs between 1982-91 translates into subsidy payments of ~ $280,000 / farm unit based on 50,000 farms, or about $30/productive acre/year. Faced with these types of structured and ad hoc government programs it is exceedingly difficult to motivate ambivalent land owners to consider woodlot management as a viable option.

5.2.4 Human Factors

In addition to the limitations imposed by economic concerns and by existing policies and legislation, some woodlot operators impose self-restrictions on the use of their resource, thereby precluding opportunities to gain financially from their private forest. These restrictions reflect differences in the way people value their woodlots, and illustrate that a variety of factors can motivate woodlot ownership, and influence resource use and management objectives Evidence exists in the literature to suggest that many woodlot owners share similar attitudes: many value their woodlots for aesthetic and other reasons, and timber production for other than subsistence use, may be of secondary importance (see for example, Clements and Jamnick 1990). Even in the eastern forests of Nova Scotia and New Brunswick, woodlot owner participation in forest management and sale of resources is low: only about 40% of woodlot owners in New Brunswick have sold forest products in the past five years, and approximately 30% of those surveyed do not intend to sell or use products from their woodlots in the next five years (Dickson n.d.). In addition, low participation rates (~ 10% of woodlot owners) in woodlot Associations is common; this reduces the lobbying power of the Associations, although in eastern Canada total participation is high enough to have significance, and the groups are able to influence provincial policy.

With regards to use of private forests by Saskatchewan's woodlot owners, Harding (n.d.) speculated that owners' attitudes towards the value of their private forests were based on a combination of factors, including:

- the predominant position of the conventional agriculture sector in the provincial economy;
- a lack of any perceived value for the trees (usually aspen) growing on the land;
- a lack of a market within economical distance for commercial species, and
- an abundance of wood from public lands.

In addition, he concluded that private landowners are not in possession of adequate information on industrial markets and wood value, and noted that the costs of obtaining this information (i.e. transaction costs incurred by the landowner) could prove prohibitive.

Dickson (n.d.) determined that in general, people whose main occupation involves primary sector activities (e.g. farmers, fishermen and woods workers) are more likely to be actively involved in harvesting and and management than other categories of woodlot owners (i.e. blue and white collar workers, and pensioners) The Farm Woodlot Owners Survey (see Appendix B) confirmed that attitudes towards tree harvesting vary widely amongst individuals: while many expressed interest in managing and exploiting their resource for profit, some expressed interest in "woodlot management for recreation, but not for profit", and in "removal of dead trees without charge"; others wanted to maintain their woodlot as it is, and indicated that no trees would ever be removed from their land.

These statements illustrate that it is important to recognize that the availability of wood from private lands may be considerably less than the absolute volume of private land timber resources thought to exist in this province, at this time. This underscores the need to educate people on the viability of woodlots and to diversify their farm operations and contribute to the economic stability of the farm unit. Success in this area has significant implications with regards to the potential economies of scale that could be achieved through new management structures (e.g. cooperative or group ventures), and the potential for woodlots to supply fibre to existing and new industries.

5.3 ECONOMICS OF PRODUCTION

The financial analyses proceeded by setting a base case for each of the three scenarios described below. The base case included our best estimates of expected revenues, costs and cash flow. Financial performance was assessed in the base case by calculating break-even selling prices, break-even transportation costs and hourly returns to owner-operator time.

5.3.1 Mixed Grain Farm- Farm Woodlot (Scenario #1)

This scenario assumes a grain farmer has some woodlot available and decides to harvest either selectively or clear cut. In this scenario, the incremental capital costs would be small, since the farmer already owns most of the equipment necessary. Most of the costs would be variable with the main one being the opportunity cost of labour.

Table 3 outlines the revenue and cost inputs used for Scenario #1.

Table 3. Scenario #1: Economic Inputs for Years 1 - 15

Operating Assumptions	
Inflation Rate	4.5%
Operating Loan Rate	13.0%
Treasury Bill Rate	9.0%
Discount Rate	14.0%
Total Acres	1,000
Grain producing acres	750
Wooded acres	250
Crop rotation	75% Crop; 25% Fallow
Crops grown	Wheat, Barley, Canola

Opening Balance Sheet:

Assets		**Liabilities and Net Worth**	
Cash	$ 4 000	Accounts Payable	$ 23 500
Inventory	14 500		
Machinery and Equipment	160 000	Total Debit	130 000
Buildings	75 000		
Land	275 000		
Accumulated Depreciation	(75 000)	Net Worth	300 000
		Total Liabilities and	
Total Assets	$453 500	Net Worth	$453 500

Agricultural Sales

Expected Yields:		Forecasted Grain Prices	
Wheat	33 bu/acre	Wheat	$4.15/bu
Barley	55 bu/acre	Barley	$2.17/bu
Canola	29 bu/acre	Canola	$6.56/bu

Note: Grain prices are expected to increase at the rate of inflation each year.

Woodlot Sales

Quantity Pulpwood	$1.75 m^3/acre
Expected price	$18.82 m^3/acre (increasing each year at rate of inflation)

Agricultural Costs

Input Costs: See Appendix D.

Fixed Expenses: (assumed to increase each year at the rate of inflation).

Expense Category	Expense ($)
Property tax	2 830
Hired labour	500
Power	1 500
Telephone	240
Fire Insurance	500
Insurance, licence (vehicle)	1 000
Building upkeep	300
General overhead	300
Accounting and legal	150
Dividends to farmer	15 000

Woodlot Costs

Direct Costs:	$/$m^3$
Cutting, forwarding and bucking	1.64
Loading	1.65
Hauling (based on 100 km round trip hauling 11 m^3 at a cost of $1.13/total km)	10.23

Indirect Costs	$
Insurance	150
Accounting	250
Miscellaneous	750

Costs of Forest Management: Operator Labour Only

Costs of Silviculture:	$
Seedlings	50

Capital Costs: (Assume that farmer has a truck and tractor available for harvesting)

Chainsaw	600
Winch	1 000
Miscellaneous	500
Total	2,100

Financing of Capital Costs:	$
New Debt	2,100
New Equity	0

Scenario #1: Net Income and Cash Flows

Appendix F includes the summarized results for the grain farm operation alone as well as the summarized results for scenario #1 (grain farm plus woodlot operation). A summary of the incremental profits and cash flow are as follows as Table 4.

Table 4. Scenario #1: Summary of Net Incomes and Cash Flows

	Projected Net Income After Tax			Projected Net Cash Flow		
Year	Farm Alone	Scenario #1	Increment	Farm Alone	Scenario #1	Increment
1	-658	697	1,355	19,623	24,166	4,453
2	8,940	9,548	608	23,726	25,316	1,590
3	14,966	15,768	802	28,606	29,680	1,074
4	20,450	21,397	947	31,393	32,548	1,155
5	24,957	25,837	880	34,385	35,620	1,235
6	28,745	29,744	999	37,081	38,191	1,110
7	32,289	33,368	1,079	39,546	40,711	1,165
8	35,663	36,855	1,192	42,141	43,335	1,194
9	38,970	40,188	1,218	44,874	46,296	1,422
10	42,001	43,302	1,301	47,780	49,454	1,674
11	45,023	46,424	1,401	50,603	52,359	1,756
12	48,080	49,584	1,504	53,555	55,417	1,862
13	51,195	52,806	1,611	56,662	58,639	1,977
14	54,387	56,110	1,723	59,928	62,062	2,098
15	57,765	59,516	1,751	63,356	65,583	2,227
Net Present Value of Cash Flows				217,235	228,581	11,346

It is important to note that the net income and cash flow reported is before any allowance for labour costs to the owner-operator.

Scenario #1: Return to Labour in the Woodlot Operation

The incremental net income and cash flow can be attributed solely to the woodlot operation. We can calculate a return to labour on an hourly basis by estimating the number of required hours for this size of woodlot. The Quebec study has collected data on time required for various woodlot functions as follows:

	Hours/m^3
Travel	.136
Felling, delimbing, slashing	.651
Forwarding or skidding	.418
Maintenance and repair	.178
Supervision, administration and marketing	.030
Total	1.413 hrs/m^3

In scenario #1 the woodlot is expected to have an annual harvest of 438 m^3, which translates into 619 hours of required work. According to Saskatchewan Agriculture (Farm Business Data Manual), a grain farmer with 750 cultivated acres will spend 600 - 700 hours per year on grain farming activities. With the addition of the woodlot in scenario #1, the total hours of work required on the farm would increase to approximately 1300 hours per year.

Based on expected incremental cash flow to the woodlot, we have calculated an expected hourly return to woodlot labour in scenario #1. This information is presented in Table 5.

The results indicate that, given the initial revenue and cost estimates in scenario #1, the return to woodlot labour is very low. This would prohibit the use of hired labour and, and in most cases, the return to labour would be lower than the farmer's opportunity cost of labour. The conclusion for scenario #1 is that the economic returns are not significant enough to attract new entrants into the woodlot industry.

Table 5. Scenario #1: Hourly Return to Woodlot Labour

Year	Hourly Return to Labour ($)
1 *	6.99
2	2.45
3	1.65
4	1.77
5	1.90
6	1.71
7	1.79
8	1.84
9	2.19
10	2.57
11	2.70
12	2.86
13	3.04
14	3.23
15	3.43

* Includes initial increase in accounts payable

Scenario #1: Breakeven Calculations

We can extend the analyses in scenario #1 by calculating a pulpwood price required to provide the woodlot owner with a reasonable return to labour. Using the financial model, we have increased the pulpwood price until the incremental cash flows provide a return to labour of $11.00 to $12.00/hour in year one, and inflated thereafter. All other inputs in scenario #1 remain constant. The pulpwood price required to produce a return to labour of $12.00/hour is approximately $33/$m^3$. The summary financial results for scenario #1: Breakeven Calculations are presented in Appendix F. Table 6 gives a breakdown of the financial results.

TABLE 6 Scenario #1: Breakdown Calculations at Pulpwood Price of $33/m^3

Year	Incremental Cash Flow	# of Hours	Labour Rate/Hour
1	10,227	619	16.52
2	7,913	619	12.78
3	6,687	619	10.80
4	7,238	619	11.69
5	6,968	619	11.26
6	6,945	619	11.22
7	7,299	619	11.79
8	7,745	619	12.51
9	8,112	619	13.10
10	8,603	619	13.90
11	9,143	619	14.77
12	9,740	619	15.74
13	10,373	619	16.75
14	10,768	619	17.40
15	11,738	619	18.96

The results for the breakeven pulpwood price calculation necessary to achieve a return to labour of $11.00 - $12.00/hour indicate that current pulpwood prices ($18.82/m^3) would have to increase to $33/m^3, almost double, in order to achieve the necessary return to labour.

Scenario #1: Transportation Costs

It can be seen from the estimates of direct woodlot costs that transportation in scenario #1 is the largest cost.

From the breakeven calculations we have observed that when pulpwood prices are as high as $33/m^3, a woodlot owner who is approximately 50 km from the buyer's location can earn a return to labour of approximately $11.00 - $12.00/hour. As the distance from the buyer increases, the transportation cost increases, causing the return to labour to decrease.

In scenario #1, the transportation cost can be calculated as a cost per km as follows:

Transportation Cost/m^3	$ 10.23
Size of load(farm truck)	11.00 m^3
Total cost for 100 km round trip	$ 112.53
Cost/km (round trip)	$1.13/km

Table 7 presents the expected impact on returns to labour when a pulpwood price of $\$33/m^3$ is used and the distance from the buyer is increased.

Table 7..Return to Labour when varying Transportation Costs

Km (Round Trip)	Average Return to Labour and Equity/Hour (Year 1)
50	15.75
100	12.00
150	8.59
200	5.03
250	1.41
300	-2.25

Conclusions for Scenario #1

The critical variables in scenario #1 are **pulpwood price** and **transportation costs** (distance from market). At pulpwood prices of $\$18.82/m^3$ the best strategy for a farmer, under the current situation, would be to clear cut the woodlot, and use the proceeds to finance the costs of preparing the land for grain farming. If the woodlot land is not acceptable for grain farming, the best strategy is to find a use for the wood, other than pulpwood.

If pulpwood prices were to increase to ~ $\$33/m^3$, the limiting factor becomes distance from the market. Table 7 presents the declining return to labour and suggests a zero return to labour occurs when the woodlot is between 125 and 150 km from the market. But at current pulpwood prices, only those woodlots very close to market, with very low transportation costs, will earn a reasonable return to labour.

5.3.2 Stand Alone Woodlot Operation (Scenario #2)

Scenario #2 represents a stand alone woodlot where capital costs are relatively low and the woodlot can be either owned or leased. The results of scenario #1 indicate that at current pulpwood prices, this scenario is not feasible. In scenario #1, capital costs were estimated at $2,100.00, but in scenario #2, the operator cannot rely on the use of grain farm equipment. The purchase of a tractor, truck, tools, buildings,

etc., would increase the capital cost and reduce the return to labour. Therefore, in scenario #2 we have modelled a leased woodlot operation, where 50% of sales are pulpwood and 50% of sales are firewood. Table 8 presents the inputs for scenario #2.

TABLE 8 Scenario #2: Economic Inputs for Years 1 - 15

Operating Assumptions

Inflation Rate	4.5%
Operating Loan Rate	13.0%
Treasury Bill Rate	9.0%
Discount Rate	14.0%
Total acres (leased woodlot)	100
Opening Balance Sheet	NEW OPERATION (No Grain Farm)

Woodlot Sales:

Quantity

Pulpwood	1.75 m^3/acre
Firewood	1.75 m^3/acre

Expected Prices:

Pulpwood	\$18.82/m^3
Firewood	\$35.00/m^3 (\$130/cord)

Both products are delivered and selling prices are expected to increase at the rate of inflation.

Woodlot Costs:

Direct Costs:

Pulpwood	\$/m^3
Cutting, forwarding, bucking	1.64
Loading	1.65
Hauling (100 km round trip)	10.23

Firewood

Cutting, forwarding, bucking	1.64
Splitting and loading	*2.00
Hauling (100 km round trip)	10.23

* Estimate based on woodlot operator interviews

Stumpage fee	1.38

Indirect Costs:	**$**
Insurance	300
Legal and Accounting	250
Marketing	250
Miscellaneous	750
Costs of Silviculture	50
Capital Costs Total	**20,000**

Includes tractor, truck, chainsaw, winch, harness, chains, tools, splitter and other miscellaneous equipment, as well as the necessary buildings. Most of the capital assets can be purchased as used.

Financing of Capital Costs	**$**	
Debt		10,000
Equity	10,000	

Scenario #2: Net Cash Flows

Appendix G includes the summarized financial results for scenario #2. A breakdown of the results follows as Table 9. The financial results indicate that in the base case, the woodlot operation is not expected to be profitable even before providing a return to labour.

Table 9. Scenario #2: Net Cash Flows

Year	Net Income after Tax	Net Cash Flow
1	-6,244	-10,438
2	-5,416	-3,552
3	-4,948	-3,732
4	-4,609	-4,016
5	-4,377	-4,318
6	-4,232	-4,642
7	-4,156	-4,989
8	-4,136	-5,362
9	-4,160	-4,970
10	-4,270	-4,115
11	-4,492	-4,400
12	-4,758	-4,735
13	-5,065	-5,094
14	-5,413	-5,477
15	-5,800	-5,888
Present Value of Cash Flows		-32,306

Scenario #2: Increasing the Size of the Woodlot

Using the financial model, we have calculated the required size of woodlot for scenario #2, which will cause the operation to breakeven, before paying a return to labour. This calculation assumes that the woodlot size could be increased without increasing the fixed costs. The leased woodlot must be increased to ~200 acres, where 100 acres is farmed for pulpwood and 100 acres for firewood, before a cash breakeven is reached.

Scenario #2: Returns to Labour

Using the financial model, we can estimate the required woodlot size to allow for a return to labour in scenario #2. We have assumed that the number of woodlot acres can be increased without changing fixed costs or capital investment.

The amount of operation labour required will increase somewhat from scenario #1, since the operator in scenario #2 must split the firewood before sale. The estimate of labour hours required in scenario #1, is 1.413 hours/m^3. We have estimated an additional .073 hours/m^3 for splitting which brings the total labour requirement to 1.1486 hours/m^3 for scenario #2 (note that the additional .073 hours/m^3 is only the incremental time required for splitting and loading compared to loading pulpwood).

The returns to labour in scenario #2 are shown in Table 10.

Table 10. Scenario #2: Returns to Labour when varying Woodlot Size

Woodlot Size (# of acres) 1)	Volume	Hours	Returns to Labour and Equity (Year
100	175 m^3	2600	0
200	350 m^3	402	0
300	526 m^3	782	$2.74/hour
400	700 m^3	1,040	$4.09/hour
500	875 m^3	1,300	$4.89/hour
600	1,050 m^3	1,560	$5.42/hour
700	1,225 m^3	1,820	$5.82/hour

Conclusions for Scenario #2

The financial results for scenario #2 indicate that if a woodlot operator leased land 50 km from the market, and worked full time in the woodlot (1,820 hours) and harvested 1,226 m^3 from 700 acres, he would earn approximately $5.81/hour for his labour. The results also indicate that the operator must be able to achieve economics of scale, by either increasing woodlot size while holding capital costs fixed or by keeping capital costs very low.

Another critical variable for scenario #2 is the transportation cost. Scenario #2 assumes a woodlot which is 50 km from market. Increasing that distance would have the effect of decreasing returns, and at some distance from market would no longer be feasible.

5.3.3 Value-Added Woodlot (Scenario #3)

Scenario #3 is the value-added scenario. In this case, the woodlot operator harvests the wood and then adds value before selling. Some examples of adding value are producing sawlogs, flooring, channel board, siding, shakes and log buildings. To do this, the operator must have additional equipment to produce the value-added products, and depending on the size of the operation, additional hired labour. The main advantage to adding value to the product is the significantly higher selling

price that can be demanded. For example, one value-added operation owner has indicated the following prices for various products:

Finished Products	Selling Price/m^3
Spruce Products	$216.00
Pine Products	$277.00
Birch Products	$616.00

Other sources have reported the following prices for non-pulpwood uses of potential Saskatchewan woodlot species.

Species/Product	Selling Price/m^3
Aspen Sawlogs	$19.00
Spruce/Pine Veneer	$35.00
Aspen Veneer	$23.00
Birch Veneer	$124.64

Capital costs for various pieces of equipment have been acquired from dealers and through interviews with woodlot operators. Some of the reported capital costs are as follows:

CAPITAL ASSET	$
Wood Splitter	4,000
Sawmill	26,000
Solar Dry Kiln	10,000
Logging Trailer with Crane	3,500
Logging Winch	2,000
Grapple Loader	6,000
Peeling and Pointing Machine	2,500

In scenario #3 we have assumed a stand alone woodlot where the objective is to add value before selling. The base case assumes 1 000 acres of owned woodlot with a mixed stand which includes birch, pine, spruce and poplar. The economic input for scenario #3 is outlined in Table 11.

Table 11. Scenario #3: Economic Inputs

Operating Assumptions

Inflation Rate	4.5%
Operating Loan Rate	13.0%
Treasury Bill Rate	9.0%
Discount Rate	14.0%
Total Acres (owned)	1,000

Opening Balance Sheet	New Operation
Woodlot Sales:	
Quantity (Variety)	0.81 m^3/acre
All Products Average	\$185/m^3

All products are delivered and prices are expected to increase at the rate of inflation.

Direct Costs:	\$/m^3
Cutting, forwarding, bucking	1.64
Loading	1.65
Hauling (100 km round trip)	10.23
Hired labour (2000 hours at \$10/hour)	20,000
Indirect Costs:	**\$**
Property taxes	700
Office expense	500
Insurance	1,000
Legal and accounting	500
Travel	1,500
Marketing	5,000
Utilities	6,000
Miscellaneous	10,000
Cost of forest management	1,000
Cost of Silviculture	1,000
Capital Costs Total	150,000

Includes a workshop and storage shed, truck, tractor, sawmill, wood splitter, solar dry kiln, logging trail with crane, logging winch, peeler and pointing machine and other miscellaneous tools.

Financing of Capital Costs:		**\$**
Debt		100,000
Equity	50,000	

Scenario #3: Net Income and Cash Flows

Appendix H includes the summarized financial results for scenario #3. A breakdown of the results follows as Table 12.

Table 12. Scenario #3: Net Income and Cash Flows Years 1 - 15

Year	Net Income after Tax	Net Cash Flow
1	22,816	42,078
2	36,175	59,026
3	43,471	59,192
4	50,042	60,443
5	56,333	62,220
6	62,504	64,559
7	68,884	67,350
8	74,973	70,508
9	81,451	81,877
10	87,924	98,655
11	94,275	104,961
12	100,893	111,410
13	107,802	118,277
14	115,033	125,577
15	122,616	133,320
Present Value of Cash Flows		431,446

Scenario #3 assumes a full time job for the operator-owner. Therefore, the new cash flow represents the total return to the operators labour, equity and land. The base case results indicate that a value-added woodlot operation can be profitable, offering a reasonable net cash flow after tax.

Scenario #3: Returns to Land, Labour and Capital

The total expected return in scenario #3 can be divided into return to land, labour and capital, where the excess or deficiency is attributed to the owner's labour and management.

For year 1, the break down is as follows:

Total expected cash flow after tax	$42,078
Required Return to Land: $150,000 @ 5% after tax	13,750
Required Return to Woodlot Equity: $50,000 @ 7.5% after tax	3,750
Excess return available to operator labour and management	$24,578

We have assumed that the owner-operator will work 2,000 hours per year in the woodlot operation. At a wage rate of $12.00/hour, the return to labour would be $24,000 in year one. Deducting $24,000 from the excess return leaves a return to management in the amount of:

Total Excess Return	$24,578
Return to Owner Labour	24,000
Return to Management	$ 578

Conclusions for Scenario #3

Scenario #3 is the only scenario modelled which provides a woodlot operator with a financial return to land, woodlot investments, labour and management, albeit a small one in Year 1. The long-term average return to management is approximately $9,300/yr. It may therefore be considered the most sustainable scenario in that the rate of return on all aspects of an operation would strongly encourage the maintenance and harvest of a woodlot over the long term.

Risk Analyses

For scenario #3, we have performed a risk analyses to determine the impact on net income and cash flow when key variables are allowed to fluctuate. First, we have performed a discrete risk analyses for the following key variables.

- Average selling price
- Size of woodlot, and
- Transportation costs

Second, we have performed a worst case, best estimate, and best case analyses to give the reader an indication of the downside risk as well as the upside potential.

Scenario #3: Varying the Average Selling Price

Holding all other variables constant we have allowed the average selling price to fluctuate while noting the impact on the present value of net cash flows. The results are as follows:

$ Average Selling Price/m^3	Present Value of Net Cash Flows
100	-43,332
150	265,604
185	431,466
200	498,349
250	718,912

Net cash flow represents net cash flow after tax available to compensate the owner for land, labour and capital.

The present value of cash flows required to provide a $13,750 annual return to land, plus a $3,750 annual return to equity, plus an annual wage of $24,000 (inflated each year), when the discount rate is 14%, is $291,624. The financial results above indicate that when the average selling price is approximately $150/$m^3$, the owner-operator is earning a reasonable return on investment and labour expended.

Scenario #3: Varying the Size of the Woodlot

Holding all other variables constant, we allowed the size of the woodlot to fluctuate (therefore varying the size of the harvest), while noting the impact on net cash flows.

The financial results indicate that a woodlot of less than approximately 800 acres (5 quarter sections) is not economically viable under the modelled conditions. It generally did not matter if the woodlot was on farmer-owner land or leased land, although the costs of leasing tend to slightly reduce net cash flows.

Scenario #3: Varying the Transportation Costs

Holding all other variables constant, we have allowed the average transportation cost to vary (varying the distance from the markets). The base case for scenario #3 assumes an average of 50 km from the markets. Obviously, some woodlot operators will be farther away from the market. The following results note the impact on cash flow as the distance from market is varied.

Average Distance from Markets (kms)	$ Average Transportation Cost per m3	Present Value of Net Cash Flows
25	5.12	451,630
50	10.23	431,466
75	15.34	410,755
100	20.46	389,950
125	25.58	368,964
150	30.69	347,976
200	40.92	303,951

The financial results for scenario #1 and #2 indicated that transportation was a critical variable. For those scenarios, only woodlot operators close to market could be viable enterprises. In scenario #3, the situation is different. In this case we have a much larger gross profit margin due to the higher selling prices. This makes the transportation costs less significant and allows the woodlot enterprise to absorb a higher cost of transportation. Hence, the value-added woodlot operation can be viable even when 200 km from markets or leased lands.

Conclusions from Risk Analyses

From the financial risk analyses results, we have concluded that a ***value-added woodlot operation*** can be viable in Saskatchewan. The key variables are quantity of sales (as determined by the size of the "woodlot"), and selling prices, and to a lesser extent, transportation costs.

5.3.4 Summary of Economic Viability of Woodlot Operations

The primary objective of this portion of the study was to examine the economic feasibility of private land forestry to assist in the development and diversification of the agricultural and rural sectors of the Saskatchewan economy. The findings of our economic analyses strongly suggest that the harvesting of poplar (trembling aspen) for pulpwood from private forest lands would have little development or diversification benefits for Saskatchewan (Scenarios #1 and #2) under the current situation.

Scenario #3, in which a woodlot operator invests in the capital to pursue ***value-added*** wood products, can show a positive economic return to land, capital, labour and management under the modelled production conditions. This scenario relies on the value-added processing of species other than poplar, for which some markets are known to exist. The extent to which woodlots operated under this scenario may help to develop and diversify the Saskatchewan economy depends on the spruce, pine and birch (among others) resources and markets being available, or the conversion of poplar from pulpwood to value-added products.

The financial results indicate that in scenario #3, a woodlot operation requires a fairly large resource base (a minimum of 800 acres). This resource base may be owned by a single farmer, a combination of owned and leased land, or may be gathered through a company or co-operative.

5.4 Product Marketability and Market Values

5.4.1 Conventional Fibre Utilization

The prairie provinces support over 550 primary wood-using industries, most of which obtain the wood from the provincial forests (Johnston 1988). The best available data for Saskatchewan (Giles 1986) reveals that there are approximately 180 primary wood using industries in the province, including sawmill-planing complexes of varying capacity; wood treatment plants; pulp, waferboard and plywood mills; and, a few miscellaneous wood-using industries (see Section 3.2). Each of these industries produces a variety of products, as summarized in Table 13.

Table 13. Primary Wood Using Industries in Saskatchewan and their Products

Sawmills and Planing Complexes	Wood-treating Plants	Misc. Wood-using Industries	Pulp, Waferboard & Plywood Mills
• dimension lumber (61.3% 2x4's)	• treated posts (70%)	• house logs (~1000 m3/yr)	• bleached softwood pulp (231 000 tonnes)
• board lumber (53.6% 1x4's)	• treated lumber (25%)	• lath material (~45 M fbm/yr)	• bleached hardwood pulp (33 000 tonnes)
• timber (71.9% 6x6's)	• treated poles (5%)		• plywood (81 M ft2)
	• custom products (3%)		• waferboard (1050 M ft2)

Woods used by these industries have traditionally been made up primarily of softwoods (mainly white spruce and jack pine). As in other parts of the country, economically accessible softwood timber is becoming increasingly scarce, and is prompting an industry wide shift to the use of poplars.

Only 17 of Saskatchewan's 180 primary wood using industries are known to purchase a portion of their wood fibre; with one exception, the large (> 1 MM fbm capacity) mills obtain most of their wood fibre through FMLA or timber permit, while the province's 116 small capacity (< 100 M fbm) sawmill operations also obtain most of their wood fibre from crown sources. The now defunct Simpson Timber sawmill-planing complex at Hudson Bay formerly purchased a small portion of its wood fibre; its closure in 1989 therefore represents a small but significant loss to woodlot operators hoping to sell some of their wood resource; this loss may be offset by the opening of Millar Western's CTMP pulp mill at Meadow Lake, which is expected to begin production in February 1992. In 1986, approximately 9% of the wood used in Saskatchewan's mills came from private land; this figure is believed to be on the increase (Jim Johnston, pers. comm.) Industries that purchase part of their wood supply include:

- the Big River sawmill-planing complex;
- 7 moderate-capacity (100 - 999 M fbm) sawmill-planing complexes;
- 5 wood treatment plants;
- the pulp mill at Prince Albert;
- the plywood plant at Hudson Bay;
- the waferboard mill at Hudson Bay, and
- 1 miscellaneous wood using industry in the Meadow Lake area.

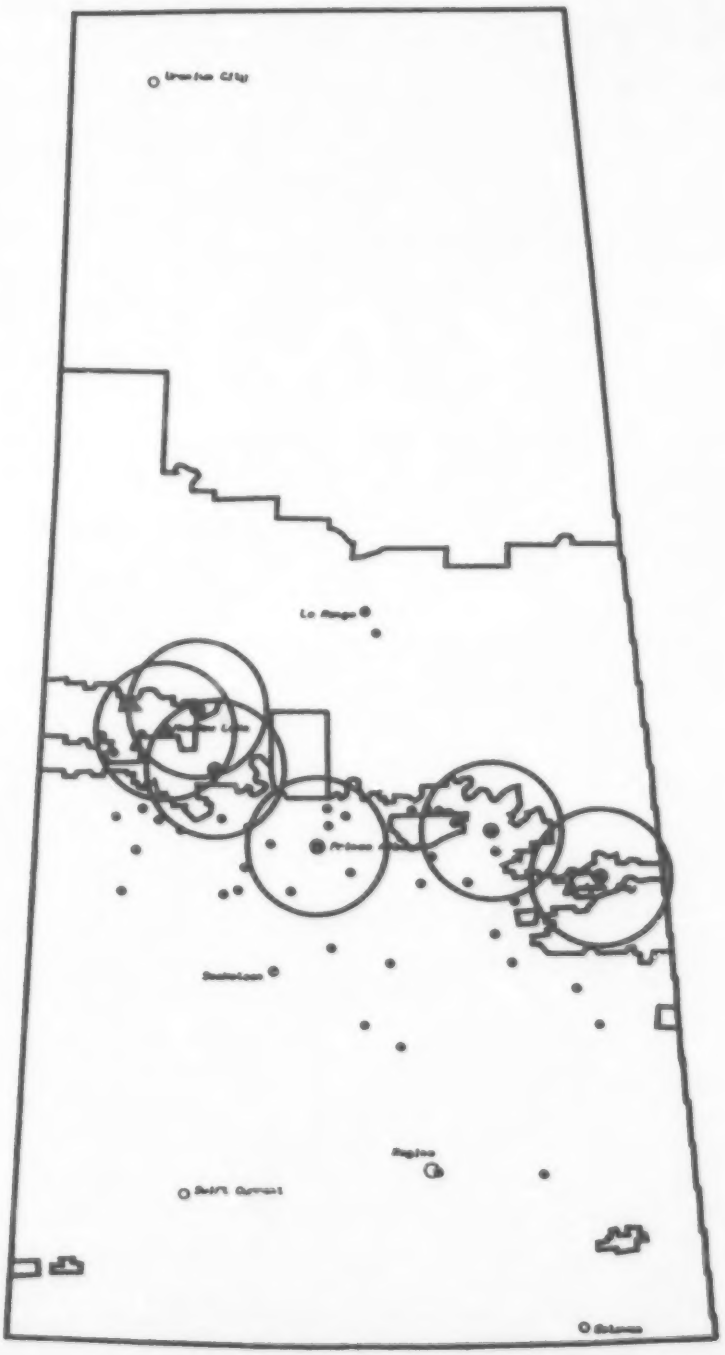

Figure 6. Spatial Relationships between Saskatchewan Farm Woodlots and the Major Wood-Using Industries

In addition, several wood-using industries are located in western Manitoba, including one pulp and paper mill, 6 building timber plants, 1 post and pole plant, and 1 hog fuel plant (Giles and Bohning 1986). While these may be more accessible to some Saskatchewan woodlot operators than equivalent industries within this province, distance is still expected to preclude access to this market.

The locations of Saskatchewan's main wood-using industries in relation to the distribution of FWAS members are given in Figure 6. Since most of these industries purchase some of their wood requirements, a 60 km circle has been drawn around these locations to indicate the region from which wood can potentially be drawn from private land based on the prices currently received for private wood; beyond this distance transportation costs exceed expected revenue from wood sales (see Section 5.3 for more details on the economics of private wood sales). The 60 km radius, however, represents optimal conditions, and does not reflect all of the constraints that exist in the physical environment that can impact delivery potential. For example, in the Prince Albert area, physical factors combine to reduce the effective distance over which contractors can be economically deliver to the mill to a maximum of 20 km (Ed Kowal, SPRR, pers. comm.); this is based on cost to purchase wood from the landowner, logging, loading and hauling to the mill. The effective distance for the individual operator is somewhat greater as the middleman is avoided. In addition, operations which can achieve a greater economy of operation may be able to expand their effective distance. Woodlots located south of the North Saskatchewan River have little potential to deliver contractor-harvested wood to the mills because of the restrictions imposed by:

- the river itself (crossing is a problem as wood loads cannot be moved across the river on the ferries;
- the increased road distance to access the bridge in Prince Albert, and
- load limit restrictions on roads within the city.

These factors combine to push trucking costs to high levels.

Of those industries which purchase part of their wood fibre supply, 6 are located close to Prince Albert, and 3 more are located in the vicinity of Meadow Lake. By volume, the major wood purchasers in the province include the pulp mill at Prince Albert, and the Hudson Bay plywood mill, which purchase 40% and 100% of their

wood fibre, respectively. As a group, wood treatment plants are the most likely industry to purchase wood supplies; with one exception, these potential markets for private land wood are all located close to Prince Albert, and hence this market is inaccessible to many woodlot operators.

Results of the FWAS membership survey revealed that very few people are actively involved in marketing primary wood products (Appendix B). Of 21 responses received, only 7 operators indicated they had ever marketed any of the wood from their woodlot; the majority of these individuals (5) had cleared minimal amounts of land and sold their wood locally for fuelwood and/or sawlog purposes. The remaining two respondents sell wood to mills, one to a private mill located about 10 kms from his woodlot, and the other to a commercial mill 70 kms away. Wood products sold by these individuals included building logs, peelers, sawlogs, pulp, posts and fuelwood. Two other individuals indicated they are currently growing trees for the Christmas tree market, but have not yet sold any product.

Woodlot operators who have cleared land and marketed wood products were all found to live within 100 kms of a mill. Only 5 of the 14 woodlot owners who have not marketed any wood from their land live within this same distance; all but one of these respondents were aware of marketing opportunities in their area, but either felt there was no demand for their wood supply, or preferred to maintain their woodlot for wildlife or aesthetic purposes.

The economic analysis (Section 5.3) demonstrates that at present prices of about $\$16\text{-}19/m^3$ for pulp, it does not appear to be profitable for individual private individuals to transport wood more than 50 km to reach a mill. Given the constraint of distance, and the current ability of the FMLA's to supply the mills with wood (as indicated by the fact that only a few of the existing mills presently accept or have need of wood from private sources), it is apparent that marketing opportunities for primary wood products from private lands are limited to a relatively few individuals at this time.

5.4.2 Non-Conventional Fibre Utilization

5.4.2.1 Fuelwood

Fuelwood consumption in Canada has had a somewhat erratic history: demand tends to fluctuate in relation to the market price of other fuels (particularly oil). Consumption of fuelwood is roughly half of levels during the 1950's; it bottomed out at 3.4 million m^3/yr around 1970, and has since been increasing in response to higher fuel oil costs, and the development of high efficiency wood stoves and furnaces. Current Canadian consumption of fuelwood is in the order of 6-7 million m^3 annually; three-quarters of this fuelwood is hardwood fibre, and most comes from private woodlots.

The ability of Saskatchewan's woodlot operators to supply fuelwood to consumers is again constrained by distance to the market. Major urban centres such as Saskatoon and Prince Albert will remain economically inaccessible to most fuelwood suppliers, although a small number of operators will be able to sell some product in these markets. Fuelwood demand in rural areas is unlikely to increase substantially, given that the population of many of these communities is declining, and cheap natural gas is available in most areas.

However, while fuelwood production has only limited potential to contribute directly to private incomes, self-use of fuelwood presents a direct saving to those individuals who use their private wood resource for home heating and/or cooking. Personal uses of wood can reduce cash outflows from $500 to $2 000 annually, a sum equivalent to 5 to 10% of many private woodlot owners' net annual incomes. In other words, wood has inherent value that may not be explicitly recognized; in choosing the "best use" of a piece of land, the value of wood as a fuel resource should be factored in, and if a use of the land for other than wood production is selected, then it should be demonstrable that the chosen alternative will produce revenues over and above the loss of the fuelwood resource.

Because of its low bulk density, high moisture content, variation in particle size distribution, and low heat of combustion, wood fibre generally requires a considerable amount of up-grading before it can be considered as an efficient and convenient energy source. Several techniques exist which can be used to improve

wood's poor combustion characteristics, which at the same time renders the product into a form which is more readily transported and stored than it is as unprocessed fuelwood. Ways in which wood can be used to provide energy include direct burning to produce steam or electricity, gasification, and pyrolosis

Direct burning of wood fibre may or may not involve prior drying or densification of the wood product. Drying and pelletization is recognized as a practical means to increase woods' bulk density and energy, and a number of commercial systems have been available in North America for some years (Stone and Associates 1983). Most systems use direct burning to generate the heat needed to dehydrate the wood fibre, then reduce particle sizes through a milling process, and densify (pelletize) the residue using a combination of elevated temperatures and pressures.

While densified biomass fuels provide several advantages over conventional fuelwood (in addition to reducing transport and storage costs it provides more precise control of the combustion process and reduces the requirements for supplementary oil and gas), the technology is not problem free, primarily because the pellets must be protected from weather exposure as they can disintegrate when wettened. The drying process itself also consumes up to 10% of the available wood supply, thereby affecting the economics of production. Despite these limitations, pelletized wood products are considered suitable for small-scale institutional, industrial and residential uses (Stone and Associates 1983), and may be very suitable for use in rural areas. Other research and development in the use of wood residues and biomass (organic) wastes is currently on-going: for instance, Ondro (1988) cites the use of aspen fibre as a supplement to cattle feed (it is added during the manufacturing of alfalfa pellets and provides proteins, nutrients, vitamins A,D, and E and minerals), and CBC Radio reported earlier this year than an Ontario entrepreneur is currently marketing fuel pellets from corn cobs, and is achieving 'good heating value' from a unit similar to a conventional wood stove.

At the industrial level, both British Columbia and Ontario have funded large projects using wood or other forms of biomass as the primary energy source. Several towns in northern British Columbia are running power plants on wood residues from sawmilling operations, and at the same time are reducing the need to incinerate this waste in conventional beehive burners (Millar 1991). These newer

technologies are expected to have low particulate emission rates, reducing some of the concerns about smoke and air quality impacts that have been voiced with regard to the use of wood as an energy source.

5.4.2.2 Christmas Trees

The Christmas Tree industry in Saskatchewan is still in its infancy. To date, only one plantation has any mature trees suitable for market (Geordie McKay, Sask. Xmas Tree Grower's Assoc., pers. comm.); several individuals have immature stock in the ground, for a provincial total of approximately 300 000 seedlings. This number is being supplemented by about 60 000 new seedlings per annum, of which an unknown percentage are lost due to disease, drought and owner disinterest.

The provincial Christmas Tree Grower's Association aims to target the local market in the future, and does not anticipate exporting trees from Saskatchewan. The local market is however, relatively small, with a total annual demand of approximately 120 000 trees (G. McKay, pers. comm.); 95% of this market is currently supplied by imported trees from British Columbia and the U.S.A.. While there is a general surplus of Christmas Trees across North America, (estimates are as high as 3:1), there may be room in the local market to support a few more growers (G. McKay, pers. comm.). Average growing time to obtain marketable Christmas Trees is about 10 years, although a few trees may be harvestable at 8 years age; these market locally for about $15 each, for a profit of about $9-10 per tree. Prices for imported trees tend to wholesale slightly lower, with the price differential reflecting costs and profits of the retailer.

5.4.3 Current and Potential Supply/Demand Trends

Despite concerns over ensuing wood fibre shortfalls, Saskatchewan retains a surplus in both softwood and hardwood resources in all Timber Supply Areas except Hudson Bay. Existing industries are therefore most likely to continue to exploit wood from Crown lands, and are unlikely to have significant need for wood fibre from private land in the near future.

Under the current situation, private woodlots have the best potential to supply fibre resources in the Meadow Lake area; here, both Mistik Management and Millar Western intend to target private lands for a portion of their future wood requirements. Mistik Management does not currently purchase any of its wood, although it has recently started salvaging aspen from road clearings and right-of-ways; aspen utilization is expected to increase in the future, and private lands may contribute up to 10% of the mills requirements (Dave Harmon, pers. comm.). The Millar Western pulp plant, which uses new technology to process aspen fibre, anticipates purchasing about 60 - 70 000 m^3/yr of wood fibre (primarily aspen, spruce and pine) when it opens in 1992. This figure represents about 7% of their total wood requirements; purchased wood may increase in importance over time (B. Peel, Mistik Management Ltd., pers. comm.). Weyerhaeuser also purchases substantial volumes of wood from private lands (≈ 150 000m^3/yr) but sustainability of this resource is unclear given the impacts of competing agricultural subsidy programs.

Private forests in the Hudson Bay area may continue to supply a small quantity of wood to the waferboard mill, but it appears there is not much available in the region that can be delivered economically. The mill itself does not bring in wood from Crown forests more than about 70 km (45 mi) distant, although it has purchased private wood from up to 120 km (75 mi) away. In the current year, MacMillan Bloedel has purchased about 4 000 m^3 of aspen fibre from private lands, at a price of approximately \$13/m^3; they would consider purchasing more if it were available for about this price (Bob Brooks, MacMillan Bloedel, pers. comm.)

It should be noted that Alberta's private land forests support slightly more than twice the timber volume than their Saskatchewan counterparts, and sustains an equivalently larger annual allowable cut; however, the private land base in Alberta is roughly three times the total area of Saskatchewan's non-industrial private forest. Forests in both provinces are comprised of almost exactly the same ratio of hardwoods to softwoods; hence, Saskatchewan's private land forest appears to be somewhat richer in relative terms, but Alberta has a clear advantage in terms of the absolute volume of wood fibre available.

Despite having larger volumes of available timber, only 6.4% of Alberta's potential poplar annual cut was harvested from private forests in 1987; roughly two thirds of this went to pulp and OSB(oriented strand board) production, one fifth was used for home fuel, and the remaining portion was sold as lumber. Private land poplar use in Alberta's four OSB and pulp and paper mills represents about 8% of the total aspen wood fibre used by these industries.

Given the similarities between the forest resources in Alberta and Saskatchewan, these statistics infer that poplar utilization is unlikely to present Saskatchewan's woodlot owners with a reliable and economically viable alternative end use for their forest resource under the current conditions. However, this could change should government and industry both address the needs of the private woodlot owners. This will be discussed later.

5.4.4 "Value-Added" Wood Fibre Marketing Opportunities

Woodlot operators who proceed to finish raw wood into consumer-ready products receive more than twice the financial return on their time and investment than those who sell unfinished wood products for fuelwood consumption or refinement at other facilities; in addition, these operators are less constrained by the need to be located close to their market, and can sell their products at distances up to six times as far as those dependent on selling to mills and other industries (see Section 5.3). However, few members of the Woodlot Association are engaged in this type of activity, and most do not foresee value-added opportunities as something that may be important to them in the future. Value-added operations are best suited to lands which support a high quality mixedwood resource.

Opportunities are thought to exist for value-added approaches in Saskatchewan, but for the most part, these have not been exploited (John Bradley, furniture consultant Buy Sask. Corp., pers. comm.). Buy Saskatchewan Corporation identifies a local market need for furniture construction, framing and casework (e.g. kitchen cabinets), but could not readily identify any Saskatchewan companies engaged in this type of activity. In contrast, several Alberta firms are known to be using hardwoods for production of similar value-added commodities. Bradley speculated that the main reason for Saskatchewan's failure to produce value-added hardwood

products in any abundance relates to the difficulties in achieving and maintaining wood quality: i.e. high moisture content causes tendencies for hardwoods to become unstable, hence, they need to be kiln dried to reduce their moisture content to around 8%. In the process of doing this, the wood tends to shrink, and its quality may be affected. A rating and grading system is therefore necessary, requiring the presence of a certified wood grader as wood comes from the mill. The need for a kiln or other drying equipment, plus the need for on-hand expertise therefore precludes many small independent woodlot operators from pursuing value-added opportunities with their wood products. Appendix I summarizes some of the technical requirements for kiln dried hardwood lumber; these specifications are issued by the Texas National Hardwood Lumber Association, and have been adopted for use in Canada (Yvonne Corneau, Forintek Canada, pers. comm.). The investment requirements for processing of these types of products may be enhanced by the development of effective group venture systems.

In Alberta, despite the relative abundance of poplars (primarily aspen), and the effort that has been expended in identifying markets for aspen products, growth in the industry has been slow: between 1980 and 1988, poplar utilization in Alberta increased from about 2.5% to 17.2% of the total timber harvest, although these species account for one-third of the province's growing stock (Ondro 1988). The relative abundance of softwoods remains a primary factor for the species' apparent underutilization; in addition, problems with wood quality have affected market development, and there remains insufficient general knowledge of the economic feasibility and profitability of poplar utilization for lumber, particle board, plywood, and energy (Ondro 1991). Inconsistency in aspen quality and dimension has also been cited as an important factor limiting establishment of a shake and shingle industry in Alberta (Silvacom Ltd. 1988).

Sensitivity analyses evaluating the economics of 15 options for industrial utilization of poplar in Alberta revealed that the highest rates of return were obtained for OSB mills, followed by waferboard mills, dimension and stud mills, and lastly, veneer and plywood mills (Ondro 1991). In general, recovery rates for veneer production is low from all aspen ages classes, reaching a maximum value of 5.4% in mature stands; for dimension lumber, studs, waferboard and energy residues, recovery rates ranged from approximately 15% to 30% in all age classes. Waferboard or

OSB products from young aspen stands yielded the maximum recovery rate of 37%. In addition to the latter, Wengert (1988) identified the following general use categories for Alberta aspen:

- construction lumber;
- utility lumber;
- furniture blanks or parts;
- pallet stock or parts;
- fuel;
- animal feed and roughage; and
- animal bedding;

Analysis of the production costs and technical merits of these products revealed that only a few of these product lines have moderate to high overall market potential under current conditions. Ondro (1988) determined that for poplar lumber production to be economical, high quality poplar stands (including FAS, S&S and IC grades - see Appendix I) must be located near the mills and close to lumber markets. In Alberta and Saskatchewan, hauling distances over 80 km are considered uneconomical for poplar (Woodbridge, Reed and Associates 1985); this effectively eliminates many woodlot operations from entry into this market.

In view of the above limitations, Ondro (1988) recommends aspen be used for the following value-added products:

- pallets,
- crates,
- cabinets,
- furniture and
- fuels.

5.4.5 Agroforestry Opportunities

Agroforestry is an ancient practice that unites conventional farming practices with the establishment and maintenance of forest cover. Established tree and shrub cover reduces wind speeds and captures moisture, thereby reducing wind erosion potential and enhancing soil moisture at the local scale; in addition it provides wildlife habitat and has intrinsic aesthetic appeal. Coxworth (1991) has demonstrated that agroforestry has significant applications in western Canada, and has proven conclusively that careful forest management can have beneficial effects

on crop production as well as timber yields. While the latter benefits take a long time to accrue, those interested in taking a long-term view in investing in their land base can over time grow sustainable timber volumes of sufficient quality and quantity to meet market needs and contribute positively to on-farm incomes.

Studies conducted at the PFRA Shelterbelt Centre in Indian Head have demonstrated increases in a variety of different crop yields in the presence of shelterbelts. Greatest yield increases have been measured for alfalfa (1.4x increase), followed by grass-legume hay, corns and sunflowers, flax and canola, barley and spring wheat. These increases are directly related to the geometry (height and spacing) of the shelterbelt species, with the most pronounced increases in yield being realized within the zone of shelterbelt influence (i.e. distances up to approximately three times the height of the dominant shelterbelt species).

The benefits of agroforestry have already been proven in New Zealand, and both the United Kingdom and Italy are currently engaged in developing models appropriate to these respective countries (Carruthers, in press). However, it should be noted that MAI's (Mean Annual Increments) of 12-20m^3/ha have been reported for the UK and New Zealand respectively (Thomas 1990) compared to ≈ 3-5 m^3/ha for Canada (Coxworth 1991); however, Thomas also indicated that agroforestry is seen to function best on 'high productivity' forestry sites and where tree species selection and tending practices Agroforestry is perceived to have the potential to contribute positively to farm incomes and rural employment by providing opportunities for economic diversification, and is a potential mechanism for securing future timber supplies over the long term. Other environmental benefits such as a reduction in farm input requirements, increased nitrate absorption and increased habitat diversity have also been cited (Carruthers, in press).

Options that could be explored in Saskatchewan include:

- production of free-range animal (chickens, pigs (especially the wild boar) and possibly other game birds (e.g. turkeys, ducks and geese)) in conjunction with forest management (i.e. address issues of farm animal welfare through outdoor production). In the UK some farmers are currently attempting to make opportunistic use of existing woodland, plantations or orchards in poultry/pig production (Carruthers, in press); such systems require relatively small landholdings, and consequently can be available at a

low rent. In addition, lands used for raising small animals can also be rotated frequently to achieve alternative end uses.

Benefits for using forestry land between clear felling and replanting include:

- additional income generated by alternative land uses;
- land is cleared and manured by free-ranging animals (i.e. pigs);
- animal producer gains land at a relatively low rent;

5.4.5.1 Mushrooms, Berries and Other Forest Resources

The economics of harvesting Saskatchewan's wild foods and other forest products, as well as the potential return on cultivating berries (particularly blueberries) has been the subject of a number of studies funded by the Agricultural Development Fund. A brief review of the results of these studies is presented here; however, no financial comparisons have been made to assess the economic value of integrating wild food harvesting into woodlot management. It is left to the individual woodlot operator to decide whether diversification in this manner is an alternative worth pursuing.

Attempts to harvest and/or culture assorted forest resources or related crops have been met with varying degrees of success in Saskatchewan. For the most part, efforts to harvest mushrooms and wild berries from the forest (i.e. to harvest an unmanaged resource) have not been shown to be economically attractive; however, as discussed below, there does appear to be some potential for good economic returns when these resources are placed under intensive management. The main limitations facing the wild food harvest industry are that it:

- provides employment for only a short period (i.e. about 3 weeks for blueberries);
- offers a low return to labour,
- requires substantial travel time,
- may be fraught with difficulties involving the storage, purchase and distribution of the harvest (Northern Harvest Enterprises 1989), and
- is subject to the vagaries of the weather.

The Northern Harvest Enterprises study concluded that "at current prices, wild blueberries appear to be competitive in the fresh fruit market if suppliers are willing to accept very low margins and are willing to achieve their returns in the form of

wages rather than as profit: there is very little if any room for 'middlemen' in the process". Despite this unfavourable prognosis, some wild food harvesting operations are providing a viable source of income supplement. For instance, Len Donais of "The Root Cellar" in Prince Albert supplements his market garden/bedding plant business with sales of a variety of forest products, including northern wild blueberries, lingonberries, high bush cranberries, mushrooms (primarily chanterelles, but also pine mushrooms and boletes). In addition, mosses, lichens and birch bark products are sold to distributors in the United States for use in the floral and crafts industries which have a high demand for "natural" products. While some of these latter products are salvaged from Timber Supply Areas in the boreal forest, none of these forest products originate on private land; forest resources on small landholdings may generate some of these products, but are unlikely to be able to sustain production over the long term.

Saskatchewan produces several varieties of edible wild mushroom, including chanterelles, morels, boletes, false morels and pine mushrooms. While these foods can produce a high economic return, harvests have been highly variable and supply cannot be guaranteed. Provincial harvests have varied from a low of approximately 1 500 pounds in 1985, to over 65 000 pounds in 1987, a "boom" year. Production has since tapered off, likely due to droughty conditions over the last few years, although other weather factors may play a role. Both local and overseas markets exist for wild mushrooms, but consumer caution has had some detrimental effect on local sales (Northern Harvest Enterprises 1989). Export markets exist for species such as chantarelles, which are popular in Asia, and some Europeans have expressed interest in securing reliable supplies of boletes (Len Donais, pers. comm.).

The advantage of pursuing development of the wild mushroom industry is that it requires little capital investment outside of the purchase of a dehydrator, and packaging and transportation of the product to market. With market development, the industry could contribute in excess of $200 000 per year to the provincial economy (Krystyn Sosulski, pers. comm.). More research is required to examine the symbioses which exist between mushroom production and timber supplies, and to examine the possibilities of inoculating tree seedlings with mychorhizae to promote mushroom production.

While harvesting of wild foods appears to be a risky venture primarily attracting "those who can find no other work" (Northern Harvest Enterprises 1989), the harvest can provide an attractive seasonal bonus to anyone who has the time to engage in this type of activity. As in the case of fuelwood production (see Section 5.4.2.1), the value of this harvest may be underrated, in that collection and preservation of these foods may reduce cash expenditures at the grocery store, and may contribute to individuals' self esteem and feelings of self-sufficiency. However, as a reliable (although still seasonal) source of income, the cultivation of wild foods has greater potential than wild (unmanaged) foods, since cultivars can be harvested much more cheaply than in the wild, and generate a much higher yield to effort expended (Brunner 1990). Brunner contends that wild berry farming enables producers to compete in the grocery store market: in 1990, managed plots in Saskatchewan yielded a total of 47 660 lbs of berries, including 33 600 lbs of blueberries (which retailed in 1990 for between $3.00 and $3.75 per pound), and lesser volumes of saskatoon berries, chokecherries, pincherries, lingonberries, and high bush cranberries. Although managed plots were located on crown and private land throughout the region between Hudson Bay and Meadow Lake, the best blueberry harvest appears to come from the northeast part of the province in the region extending from Prince Albert north to La Ronge and east to Hudson Bay; in 1990 yields of 800 pounds per acre were recorded from research plots near Besnard Lake, and are expected to increase as the stands fill out (Brunner 1990).

Two important agricultural benefits result from blueberry cultivation: firstly, it allows marginal agricultural land to be brought into production, thereby adding directly to the agricultural economy, and secondly, the perennial ground cover and dense mat of underground rhizomes formed by the blueberry plants protect soil from erosion. This latter fact is important, given that blueberries usually grow in light, sandy soils that are erosion prone (Brunner 1990).

Marketing of blueberries has involved selling the fruits to berry buyers throughout the province. Berries are sold in fresh or frozen form, and as value-added products such as juices, fruit leathers, concentrates, jams, jellies and pie fillings. Products are sold at road side stands, to grocery and health food stores, and may be aimed at the tourist market in gift pack form. High bush cranberries also show potential for

processing into other value-added products. However, markets for most other wild berries (i.e. lingonberries, saskatoons, chokecherries, strawberries and raspberries) appear limited to roadside stands, farmer's markets, and grocery stores at the present time.

Pursuit of the health food and pharmaceutical markets may be a worthwhile economic activity that would require little capital outlay except in the development of a marketing plan. Forest products which could be sold to these industries include such species as reindeer moss, labrador tea, wild mint, cattail, fiddlehead (ostrich) fern, wild onions and wild mustard.

5.4.5.2 Maple Syrup

Maple syrup has recently been identified as a potential product from Manitoba maples in Saskatchewan. This may provide a viable alternative source of income to woodlot owners in southern Saskatchewan, but has limited potential to the majority of woodlot owners in the fringe area between the agricultural zone and northern boreal forest; the distribution of Manitoba maples is limited to southern Saskatchewan, where it occurs most commonly in moist areas along stream banks and in valleys, shelterbelts and occasionally in wastelands and roadsides (Little 1980).

Jim Johnston of Forestry Canada envisions a farmer bringing in $10 000 in a season from the sale of maple syrup, but contends that identifying a market will be the key to this success. While no commercial production of this product has yet been attempted in Saskatchewan, there appears to be sufficient opportunities for a producer to market maple products though supermarkets, gift and health food stores. Johnston suggests that potential producers may wish to attempt:

- drawing on information from Ontario, which have a long history in marketing maple syrup and other maple-based products; and
- approaching Forestry Canada to gather more information on tree management.

5.4.5.3 Recreation Development Opportunities

Opportunities to diversify woodlot operations by providing recreational opportunities to tourists from within and outside of the province appear limited at the present time. The main reason for this is that to attract tourists, most recreational developments require considerable capital expenditure, although there is no guarantee this will be recouped once the public arrives. Development of cross-country ski trails may not incur much additional cost on a managed woodlot, but could only sustain low user fees. Some intensively managed tourism facilities have been developed on private woodlots (e.g. Snow Castle Lodge at Candle Lake); however, despite the abundance of amenities offered by these facilities, visitor usage is currently in a depressed state. Provincial taxation levels are cited as the prime reason for low visitation, and appear to have adversely affected local (i.e. visitors from Saskatchewan), other Canadian, and international visitation. Nonetheless, recreation is a competitive market and successes are dependant upon broad initiatives to attract tourists to Saskatchewan.

5.4.5.4 Wildlife Viewing, Hunting and Game Farming/Ranching

Game Farming/Ranching

The concept of exploiting the aspen parkland and mixedwood boreal forest zones for game ranching enterprise was first postulated by Telfer and Scotter (1975) and promoted by Bob Hudson from the University of Alberta and more recently by Renecker *et. al.* (1989); they did so primarily in the interest of conservation -- to stem the tide of forest clearing and burning for agriculture (G. Scotter, p.c.). Their broad notion was not single species production, but to herd mixed game species on very large areas of crown land, with stocking rates equal to naturally occurring densities. Economic analysis of game ranching suggests that the industry can generate high potential profits from a land base of approximately 240 ha. The opportunity to further engage in mixed game farming- forest fibre management operations may present additional economic opportunities as part of a diversified multi-objective approach to land use. The relevance to woodlot operations is obvious in that 'woodlot' lands may be considered ideal 'habitats' on which to conduct game farming enterprises. However, game farming/ranching has not been universally endorsed by the general population and opposition groups believe it is

an industry with potentially severe environmental and social consequence. We have therefore presented a more detailed overview of the pros and cons of the continued development of this industry, without drawing specific conclusions respecting our opinions.

Following the model of Hudson *et al.* (1989), game farming (i.e. intensive production) may be further subdivided into moderately intensive pasture farming (which would involve woodlots) and highly intensive feedlot farming. Game ranching denotes a more relaxed management style in keeping with the model of Hudson *et al.* (1989). It describes commercial production of big game herds in the manner of raising beef cattle in large ranchland (woodland) settings.

Legislation in Saskatchewan (Section 30 of the 1979 Wildlife Act, Sections 15 & 18 of the 1987 Animal Products Act, and Regulations 666/87) permits commercial production of moose, wapiti, mule deer, white-tailed deer, antelope, caribou, and fallow deer. The sale of game meat is permitted through licensed game meat merchandisers. As of April, 1990, there are about 2000 farmed wapiti in Saskatchewan. Breeding stock originated in Ontario, Alberta, and USA.

Industry growth trends, and the testimony of growers suggest that commercial production is currently profitable. A recent (February 24, 1990) article in the Otago Daily Times of New Zealand stated that sheep and cattle numbers in that county fell by 6-6.8%, although the numbers of deer "boomed up to 780 000 head during the June, 1989 year on the back of good velvet prices and expectations for venison prices." However, dramatic declines in agricultural subsidies In British Columbia, likewise, fallow deer farming commenced only two and a half years ago, and has since grown into a $12 million annual industry.

Commercial game production is economically sound business because

(1) Traditional agriculture production businesses are declining;

(2) Market demand for game products is relatively high; and

(3) Production costs of game animals are relatively low.

Struzik, (1988) noted that commercial game production, "made agricultural and economic sense, especially for the prairie provinces which were being forced to increase their subsidies for the already established grain and cattle industry. It provides an excellent opportunity for those provinces to increase the productivity from marginal agricultural lands; woodlots are frequently classified as such.

Cliplef (1988) listed the most commonly proffered reasons in favour of commercial game production, all of which are homo-centric, economic reasons at root; he commented on each:

1) That commercial game production offers economic advantage over other forms of wildlife production: market demands fluctuate, and it is expected that once the market is saturated with breeding stock, meat prices will level and/or decline;

2) That the revenue of many existing farms could be enhanced by channeling some farm resources into game production: this is credible;

3) That wildlife production will increase production from marginal lands: this is credible, but only with high capital investment;

4) That wildlife production will preserve the natural landscape: this may be true, but the natural wild environment would not be preserved;

5) That under wildlife production systems wild game will be available to the non-hunting public: this is not necessarily true if we are dealing with a new type of domestic animal;

6) That game meat is superior for health reasons because of low fat content: this may not always be the case if the animals are consuming a high energy feedlot diet designed to maximize production;

7) That wildlife production systems will create employment: this is credible;

8) That wildlife production will increase wildlife viewing opportunities: this actually involves the viewing of domestic wapiti on pasture, and not that of wild wapiti in their natural wild environment.

A number of major issues have been raised by opponents of game farming/ranching operations including:

i) Impact on Hunting Opportunities and Enjoyment

ii) Impacts on Indigenous Peoples

iii) Impacts Directly on Animal Populations
- Impacts on Wild Predators
- Impacts on Other Wildlife
- Psychological Impactsduring handling of animals
- Threat of Wildlife Habitat Loss by attrition and displacement of indigenous species
- Threat of Increased Poaching and Rustling
- Threat of Disease and Parasites to Wild Populations
- Major Diseases/Parasites And Their Potential Effects
  - *Meningeal worm*
  - *Brainworm*
  - *Besnoitiosis*
  - *Johne's Disease*
  - *Wapiti Wasting Syndrome*
  - *Brucellosis*
  - *Tuberculosis*

iv) Threat of Gene Pool Pollution

v) Unnatural Selection For Human Advantage

vi) Impacts on the Vegetation Base

vii) Impacts on Ecosystems

viii) Intensive Production and Loss of Productivity

Game ranching has been claimed by its proponents as 'sustainable development' in action and by its critics as a menace to the natural world. As the debate unfolds, the contribution that the industry brings to diversification appears as realistic as the outbreaks of tuberculosis among game farmed animals. However, one cannot necessarily argue against the fundamental logic of combining landscape management with economic enterprise and the wisdom of combining animal unit management with that of biomass or wood fibre. The two endeavours may complement one another to serve the ends of the land and enterprise.

Wildlife Viewing and Hunter Outfitting

A more passive approach to deriving income from wildlife can be derived from selling viewing or hunting opportunities. The economics of 'selling' viewing are suspect at this time as the public has not demonstrated a strong willingness to pay private landowners directly for viewing opportunities. Private landowners are

forced to compete with crown lands, particularly Parks for providing this experience. Conversely, greater opportunities likely exist for 'paid' hunting, primarily because the world has a large hunting fraternity which have limited opportunity to harvest. Saskatchewan boasts some of the best 'potential' opportunities in wildlife outfitting experiences, but these have been largely restricted by regulations which severely limit the licencing of non-resident hunters. In addition, some of the arguments against 'game ranching' also are forwarded to the 'paid hunting' issue. Of particular concern are the restriction of access of the public to wildlife which are owned by the crown, on private lands and the emergence of hunting as an elite sport.

Opportunities for exploiting wildlife resources on private land are limited where the land base is small in size. For large game animals such as bear, the Saskatchewan Outfitter's Association recommends a minimum land base of 95 km^2 of predominantly forested habitat for provision of sustainable hunting opportunities (Hal Stupnikoff, pers. comm.). Land base requirements for sustained deer hunting are not accurately known, but Stupnikoff estimated at least 13 km^2 of contiguous land would not be an unreasonable figure; however, the best white-tailed deer habitats in the province lands with a high mix of forest cover in proximity to agricultural lands resulting in high quality foods found in close association to cover. Mixed forest harvesting operations would further diversify wildlife habitat. Even small species such as upland game birds require fairly substantial land areas (i.e. 4 km^2) for sustainability. In this context, sustainability refers not only to the availability of sufficient habitat for species' life requirements, but also to "economic sustainability": i.e. the ability to provide sufficient opportunities to attract an adequate number of people from which to draw and income.

It is evident that annual revenues derived from non-commercial utilization of wildlife are much greater than generally known. Filion et al (1985) reported that 90 percent of Canadians polled in 1981 participated in at least one wildlife related activity, and 70 percent participated in two or more such activities. They predicted a 16.7 % increase in the number of hunters by the year 2001 (from 1.8-2.1 million people), and a 24.6 % increase in the number of non-consumptive users (from 13.4-16.7 million people). Similarly, the World Wildlife Fund National Gallop Poll reported that 60 % of respondents believed that wildlife viewing and protection of

endangered species was of greater priority than hunting, trapping, and fishing (Hummel, 1988).

Filion *et al.* (1985) further reported that in terms of direct expenditures, hunters contributed $1.2 billion (29 %) of the total $4.2 billion spent during 1981, the largest contributor being non-consumptive users. Considering hunters by themselves, big game hunters were by far the largest contributor, spending $473 million per year; this amounted to 39.9 % of the total monies spent by all wildlife users. On the basis of growth trends in non-commercial wildlife utilization, these expenditures are expected to increase dramatically.

The question is, will hunting safari style be as satisfying to hunters as true wilderness hunting (Bill Pruitt, p.c.)? Cliplef (1988) observed that many people object to hunting on game ranches, and that it would be particularly objectionable on an intensive production system. He felt it would be less objectionable on an area of 20 km^2 if the animals are wary and not habituated to humans. In addition to encouraging a market for safari hunting, it is also likely that removal of large tracts of land from public hunting access will limit hunting to fewer, relatively wealthy people. However, in a report to the CWF Board, Cliplef (1988) observed that the fear that wildlife will be taken from the people and given to private individuals is unfounded. He felt that since ranched wapiti should not be considered as wildlife, but only a domestic game animal, therefore as long as wildlife and domestic game are kept well separated, commercialization poses no such threat.

The woodlot connection is direct, in that private woodlots provide critical habitat to prized game species including white-tailed deer and elk. However, establishing hunting opportunities require a large land base, and therefore would best be served by group ventures whereby several landowners would agree to maintain woodlots as wildlife habitat and would receive remuneration for right of access to lands. The woodlots could be managed for both fibre and wildlife habitat simultaneously to enhance the return to the owner. Paid hunting is highly successful in places like Texas and New Mexico where large ranches cater to hunters, capitalizing on agriculture, wildlife and the service industry to hunters. It has significant potential in Saskatchewan, but requires that landowners control access and hunting

activities. Changes in provincial legislation would be required respecting the availability of non-resident licences and liberalization of the outfitting regulations.

6.0 DISCUSSION AND CONCLUSIONS

The Farm Woodlot Study has determined that opportunities and options for primary uses of wood fibre from private land in Saskatchewan are limited under the current situation. The main reasons for this are economic constraints; inadequate market demands for wood fibre; and, provincial policies (see Section 5.2) which favour development of Crown resources over private stock, and which enable public companies to obtain wood from the provincial forest at subsidized prices. In addition, the inability of private landowners to provide industry with a secure, reliable, and sustainable source of wood supply contributes to industry reluctance to make use of this resource.

Economic constraints are most strongly felt by small operators whose primary source of income is their woodlot. For these operators, woodlots are not profitable unless economies of scale can be improved through increasing the woodlot size while essentially holding capital costs constant. Provincial wood pricing policies, coupled with low demand for wood and effectively eliminates most farmers from opportunities to sell wood fibre to pulp mills for a profit. Changes in both public and corporate policies and market demands are necessary before sales of private wood fibre become 'obvious' economic opportunities.

Secondary processing of wood fibre to produce value-added commodities is economically feasible and profitable. However, to be successful larger land bases (at least 800 acres) with quality species mixes (softwoods and hardwoods) than occur on most woodlots are required to produce a secure and sustainable supply of wood. The market for finished products is presently relatively small and not clearly defined, but opportunities do exist for production of veneers, panelling and building timbers. Persons contemplating producing such value-added products must have access to high quality timbers that meet stringent grading standards, and must recognize there is considerable wastage involved; i.e. profitable uses for wood residues must also be found, or else the business' profit margin will be severely

eroded. Despite these qualifying statements, entrepreneurial activities that use forest products in new and innovative ways have a reasonably good chance of succeeding; they will, however, appeal only to those willing to take a risk.

The study failed to identify any proven appropriate 'fibre-based' alternative land use options that might be profitable on Saskatchewan woodlots under the current situation of subsidies and policies. However, one must caution that even if woodlot owners were to receive fair pricing for their wood (i.e. ≥ $\$33/m^3$), there is no guarantee that wood fibre would be produced on a sustainable basis: better pricing may accelerate the process of profit-taking through accelerated land clearing. The difficulty in identifying alternative, viable, land use options partially reflects problems with the size and geographic distribution of the private forest resource. This prohibits economies of scale from being realized, and makes difficult the implementation of alternative land management strategies (e.g. cooperatives and group ventures). Another major problem relates to the lack of lending institutions' appreciation of wood fibre as a cash crop to provide collateral critical to the purchase of capital equipment.

Recreation opportunities, including tourism, hunting, wildlife viewing and game farming, require larger land bases than exist on most woodlots, and, in most instances, recreation facilities already exist to meet the existing market demands for these activities; however, the potential for growth in this area is almost limitless.

In terms of new ventures, pursuit of agro-forestry related activities is recommended because of its demonstrated potential to increase grain farm yields and serve the interests of good land management; other economic benefits from wood produced in conjunction with agro-forestry operations can accrue in the future, but would generally not be fully realized for many decades. Agro-forestry's future benefits may be enhanced through experimentation with hybrid varieties of stock: planting faster growing varieties would permit more frequent harvesting than can be achieved from native (indigenous) species.

Production of non-conventional forest products has some potential for market activities. The Christmas Tree industry faces major competition from outside the province; the local market has the capacity to support a few intensive Christmas

Tree farms, but could be easily saturated by the entry too many operations into this industry. Production of berries, mushrooms and other forest products has potential in some areas, but generally appear best suited to the boreal forest rather than the forest fringe.

In summary, wood fibres from private land will not contribute substantially to the Saskatchewan economy without a concerted effort on behalf of woodlot owners, the government and industry to make it a reality. Woodlot owners must unite to increase peer and public awareness of the industry potential and strive to maximize financial returns from wood fibre by producing and marketing value-added wood products; government must make changes to those policies which negatively impact on woodland integrity and establish incentives for people to manage land wisely. Industry must assess whether or not having a sustainable supply of quality woods from private lands is a worthwhile economic and social objective of their corporate commitment to sustainable forestry and rural development.

7.0 STRATEGIC PLAN AND RECOMMENDATIONS

The FWAS must recognize that opportunities to diversify and stabilize incomes through exploitation of private land forest are limited under the current situation given:

- the existing structure of government and industry policies in Saskatchewan;
- the scarcity of markets for wood (primarily hardwood) products, and
- the relatively small size and wide geographic distribution of private forest holdings in the province.

FWAS activities must therefore work around existing policies and their lack thereof, and must adopt innovative approaches to land management that recognize the uniqueness of the land tenure system as it relates to Saskatchewan's private forests. In some cases, this may involve direct confrontation with government policy-makers, and explicit demands for fair treatment of the public by those who profess to ensure their protection. The role of the FWAS should be primarily to act

as a coordinating body to facilitate member cooperation and sharing of information; in particular, FWAS should:

- act as a lobby group;
- provide members with information and services, and
- encourage woodlot owner participation in the Association, and
- development of a legislative basis for alternative management structures

Activities that should be pursued to fulfil these roles are described below.

7.1 THE ROLE OF THE FWAS AS A LOBBY GROUP

FWAS needs to act as a lobby group to pressure both industry and government for change. While individual members of Association can initiate dialogue with government and industry, the chance of succeeding would improve dramatically if more people were to take an active role in this regard. This means that the FWAS must attempt to increase its membership substantially, and must motivate existing members to take a more vocal role in provincial politics. Issues which need to be raised in the public conscience fall into 3 general categories:

- recognition of the value of wood on private lands;
- recognition of private lands as a forest resource;
- recognition of diverse economic potential private forest lands provide for recreation, game farming/ranching, paid hunting etc., and
- acceptance that private forestry enterprises are a legitimate option for achieving diversification of the Saskatchewan economy.

1) Recognition of the Value of Wood on Private Land

FWAS needs to lobby the government and alert the general public to the situation that exists in the present pricing structure for wood. In particular, members must press for:

- prices for wood which address both reasonable profit and sustainability;
- equal access to government monies for forest maintenance, protection and reforestation (i.e. greater share of FRDA funds);

- increased government responsibility for provision of seedlings, silvicultural treatments and insect/disease protection (e.g. on a cost-shared basis)

2) Recognition of Private Lands as a Forest Resource

The FWAS needs to impress upon the general public that there are significant social benefits which accrue to all of Saskatchewan from the management of private lands. FWAS should encourage members to put their lands to the "best possible use" and aim to work closely with other organizations (e.g. the Wildlife Federation) to identify areas where wildlife habitat maintenance and conservation should take precedence over forest harvesting.

The Agricultural Advisory Committee of the Saskatchewan Round Table on Environment and Economy (1991) addressed the issue of agroforestry and woodlot management and provided the following recommendations:

- "Development of a 'level playing field'. These may be incentives or regulations to encourage the use of private wood resources preferentially over public forests. Thereby provide a market for trees, on the condition that the woodlots are harvested and maintained on a sustainable basis. Management of private woodlots, and the resultant increased productivity, could reduce pressure on public lands for trees.

- Woodlot management education and research. As applied to the Saskatchewan situation, it assists owners in developing long-term woodlot management plans.

- Discourage clearing of forest lands for increased grain production.

- Development of the infrastructure for the movement and marketing of wood from private woodlots to central processing centres such as pulp and saw mills and the sale of wood products from woodlots to international markets."

These generic recommendations cannot be fully accepted at face value. The development of a "level playing field" is applauded, but not through mechanisms which deepen the cycle of the use of subsidies. These very factors represent the root cause of our problem in the whole area of agriculture and forestry. Efforts to revise existing policies to ensure that

marginal lands are not converted from wooded cover to cultivated uses and the re-establishment of woodlands on suitable marginal lands now cultivated, should be strongly promoted. This will require a concerted approach to revision of federal and provincial agricultural policies and provincial forestry policies to ensure that incentives which promote non-sustainable land use are removed. The land assessment system currently administered by the Saskatchewan Assessment Management Authority must recognize 'optimum use of land' as a foundation of the tax system. Immediate steps should be taken to retard any further clearing of agricultural lands which are 'best suited' to wood production. This will necessitate a change in policy and the training of assessors to recognize wood fibre as a legitimate crop. The progressive removal of taxes on private lands currently under wooded cover would be a strong statement of commitment by the province to sustainable land use. All other current policies which promote the expansion of cultivation should be reviewed and altered where necessary. Notably, Saskatchewan Crop Insurance Programs and GRIP should consider a system of cross compliance to ensure that strong measures will be taken to discourage marginal land cultivation. In addition, trees should be recognized as a crop which can be insured against loss to provide the landowners with collateral against which they can finance their forest management operations.

Saskatchewan Parks and Renewable Resources must also develop a policy which addresses woodlots as a viable economic resource. Serious shortfalls of information currently exist respecting the volume and quality of wood on private lands. The development of any viable industry must be supported by good information. Therefore, policy changes should be made within SPRR which address the commitment of this agency to private woodlot management and the development of specific objectives to ensure that the private land base benefits from provincial initiatives.

Policy changes should be proposed in order to establish suitable incentives for optimal land management. Issues that should be raised include:

- changes in taxation structures, such as:
  - proportional reduction in property taxes for forest land;
  - income tax exemption for logging income up to a set maximum (Ontario's Woodlot Licence Program exempts first $25 000 of logging income);
  - preferential tax structure for Managed Lands; extend definition of Managed Lands to include other land use options (e.g. habitat conservation) if deemed most suitable;
  - income tax deductions for woodlands expenses (e.g. silvicultural requirements, farm fuel, and depreciation of equipment), and
  - changes in Capital Gains Tax structure (e.g. to allow transfer of property at no cost to heirs).
- caveats on land use to ensure "best use of land" (i.e. to discourage land clearing in marginal areas for farming)

3) Recognition of diverse economic potential private forest lands provide for recreation, game farming/ranching, paid hunting etc.

   The FWAS should more fully investigate multiple use objectives which can be derived from private forest lands and lobby government to address any legislation, regulations or policy which limit these opportunities. In particular, paid hunting may provide substantial direct and indirect benefits for landowners to manage for wildlife habitat and to market the opportunity for resident and non-residents to hunt. Current legislation permits outfitting, but does not promote paid hunting or access fees as an acceptable form of economic activity.

4) Acceptance of Private Forestry as a means to Diversify the Economy
   - equal access to markets through requirements that industry be legislated to purchase wood from private lands;
   - changes in taxation structures to provide incentives to manage forests well.

7.2 FWAS Member Information and Service Needs

The FWAS must continue to address the organizational needs of their membership. Dissemination of information and organizational coordination and leadership is critical.

Woodlot owners have expressed concern about lack of information, and desire to acquire better advice and information on managing their forest resource. Inventory

data from private lands is critically lacking and must be collected if woodlots are to be properly managed. Provincial resources must be made available to woodlot owners in order to assist with completion of inventory data, determine annual allowable cuts, and to develop management plans that consider individual owner's forest management objectives, and which propose the best use for the land. To gather this data, the FWAS must either lobby for greater involvement of the provincial forest land extension services.

The FWAS might also wish to consider establishing a network silvicultural contractors and truckers who could be contacted and hired by individual woodlot operators. In this way, capital expenses for equipment could be reduced, and economies of scale could be improved, assuming contractors were able to service a number of woodlots on a specified schedule. A detailed management plan for regional woodlots could be drawn up if sufficient numbers of members showed interest in the program.

FWAS needs to gather and disseminate information amongst its members. This information should pertain both to the status of the resource on private land, and should keep abreast of market trends and technological advances. Members should be required to provide the Association with specific details regarding their forest resource and harvesting practices, their personal objectives for its use, and information pertaining to markets for products. Data needs include:

- forest inventory;
- stand volumes, density and relative health
- annual allowable cut, and
- silvicultural needs

Woodlot owners could also attempt to target government and industry funds by proposing to become active participants in research studies. Members could apply for funding from these sectors and in return agree to gather long-term data on their individual forests, thereby contributing to knowledge that may prove useful in such areas as disease control (e.g. spruce budworm).

In addition to providing member services, the Association must accept and impress upon its membership that primary wood-using opportunities have potential to supplement other farm income. The Association should actively encourage woodlot operators to pursue value-added activities and to produce finished lumber products of any kind.

7.3 MANAGEMENT STRUCTURES TO IMPROVE WOODLOT VIABILITY

The following section proposes alternatives action plans that will enable FWAS to coordinate its activities and improve the efficiency of private land forestry in this province. The first plan is based on the premise that woodlot operators will continue selling unfinished wood products to conventional industries, and proposes a system that may improve woodlot efficiency; the second plan proposes a mechanism that would allow woodlot owners to pursue value-added activities. Both plans call for improving economies of scale through cooperative (group) ventures. The third plan addresses opportunities for expanding woodlots to the crown base. The benefits of cooperative action plans were described earlier (Section 5.2.1.2).

7.3.1 GROUP VENTURE MANAGEMENT PLAN FOR SERVING CONVENTIONAL (FIBRE) INDUSTRIES

The planned activities described in the following section would be best suited for the areas around Meadow Lake and Prince Albert. The new CTMP mill under construction at Meadow Lake has substantial wood requirements, and a commitment to purchase wood from private sources and Prince Albert Weyerhaeuser mill currently purchases private lands wood. The establishment of 'Group Ventures' for each of these areas under the direction of the FWAS should be considered to coordinate the management required to harvest and deliver wood to customers and to provide services vital to the growth and maintenance of private land forestry.

The FWAS should lobby with government to recognize the group ventures as legal entities and provincial resources (ie SEDCO) should be targeted to ensure that group ventures have access to needed investment capital. Group venture

membership should be voluntary but binding, and managed by a duly elected Boards of Directors and Constitution. These organizations should work to identify specific economic opportunities in the broad area of forest enterprise, and to use their economic clout to provide their membership with access to capital resources to ensure efficiency of all aspects of the management cycle. In addition, the Group Ventures should work closely with the major industries and government to seek substantive pricing premiums tied to the ability of the Group Venture to guarantee long term delivery of mill-acceptable products on schedule, and the management of the land base as a sustainable forest resource.

GOAL: To Achieve Income Stabilization and Diversification through Marketing Primary Wood Products

OBJECTIVES: Improve Security of Supply and Delivery of Wood to Industry

TASKS:

Identify woodlot owners interested in participating in Group Venture activities;

Identify owner objective for their land and determine the optimal use of each parcel, keeping in mind alternatives (e.g. Xmas tree production, other forest products, recreational and aesthetic value, value to wildlife);

Zone woodlot membership into Farm Woodlot Management Units (FWMU's) centred around target industries (to a maximum distance of 120 km);

Undertake inventory of wood volumes and standing timber within each FWMU;

Determine the sustainable allowable annual cut (AAC) that could be achieved within the FWMU;

Approach target industry with a detailed proposal to guarantee delivery of a specified wood volume at pre-defined intervals (e.g. quarterly or bi-annually);

Determine harvesting schedule to selectively remove wood from woodlots within the FWMU over a 20-year period;

Line up Contractors to do wood pick-up and delivery to mills; silvicultural work, and reforestation;

Co-ordinate movement of individuals and equipment between woodlots;

Prepare detailed submissions to federal and provincial governments for funding; propose policy options to cabinet;

Approach urban organization with Xmas Tree delivery proposal or sale of other forest products.

7.3.2 GROUP VENTURE MANAGEMENT PLAN FOR VALUE-ADDED OPPORTUNITIES

Value-added opportunities have clearly been identified as a potentially attractive economic opportunities for private land woodlot owners. However, these operations require access to a minimum land base of 800-1000 acres which supports a high quality mixedwood forest. Unfortunately, most woodlots in Saskatchewan fail to address both criteria. Group Ventures may provide individuals with access to the land base necessary to establish a profitable operation and the capital resources critical to product development.

GOAL: To Achieve Income Stabilization and Diversification through Marketing Value-Added Wood Products

OBJECTIVES: Achieve Security of Supply and Develop Infrastructure to Process Secondary Wood Products

TASKS: Identify woodlot owners interested in participating in group venture activities;

Identify owner objectives for their land and determine the optimal use of each parcel, keeping in mind alternatives (e.g. Xmas tree production, other forest products, recreational and aesthetic value, value to wildlife);

Zone woodlot membership into Farm Woodlot Management Units (FWMU's) centred around target markets (i.e. major population centres such as Prince Albert and Saskatoon);

Undertake inventory of wood volumes and standing timber within FWMU;

Determine the sustainable allowable annual cut (AAC) that could be achieved within the FWMU;

Identify land base on which new venture is to be situated;

Conduct market study and develop detailed business plan; identify advertising strategy for finished products;

Prepare detailed submissions to federal and provincial governments for funding; pool capital and arrange purchase of mill (if required), and kiln-drying facilities;

Determine harvesting schedule to selectively remove wood from woodlots within the FWMU over a 20-year period, and initiate activities.

7.3.3 Crown Land Addition: Management Plan for Value-Added Opportunities

Value-added approaches have clearly been identified as a potentially attractive economic opportunities for private land woodlot owners. However, these operations require access to a minimum land base of 800-100 acres which supports a high quality mixedwood forest.

The best forest resources currently exist on Crown Lands, most of which are allocated through the FMLA process, thereby restricting or limiting the opportunity of the small operator. However a large amount of forested Agricultural Crown Lease land also exists; these lands are primarily managed for grazing and secondarily for wildlife; relatively large areas support forest cover which could contribute substantially to the expansion of the woodlot business.

A number small operators have also been allocated wood on the FMLA's through agreements between government and industry, but the onus for management of the land base lies with industry. However, the current situation does not tie the small operator to intensive management to ensure sustainability. Landowners with private land forests, should be provided the opportunity to match their current woodlot holdings through secure long-term leases on the Provincial Forest land base. The objectives of the agreements should be to promote intensive forestry and the expansion of woodlots through value-added product development based on sustainable forest management.

GOAL: To Achieve Income Stabilization and Diversification through Marketing Value-Added Wood Products by providing existing woodlot owners with access to long-term leases on the Agricultural and Provincial Forest Crown land base.

OBJECTIVES: Achieve Security of Supply and Develop Infrastructure to Process Secondary Wood Products

TASKS:

Identify woodlot owners interested in expanding the size and scope of woodlot management operations;

Establish complementary objectives for the management of the private and leased Crown lands;

Undertake inventory of wood volumes and standing timber within the private-crown woodlots;

Determine the sustainable allowable annual cut (AAC) that could be achieved within the woodlots;

Develop long-term management plans to satisfy the Crown forest management principles of the province and the objective of value-added product development;

Determine harvesting schedule to selectively remove wood from woodlots within the woodlot over a 20-year period, and initiate activities.

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APPENDIX A

LITERATURE REVIEW

APPENDIX A: LITERATURE REVIEW

Information presented in this section represents a cross-section of professional opinion relevant to these areas of interest, and provides a framework from which it was possible to deduct the implications to the future of private woodlot forestry in this province. Reviewed literature is cited in alphabetical order by author.

The economic literature review included federal and provincial government studies which focussed on the economics of private woodlot management in Canada, as well as selected papers which addressed the economics of private woodlot in Saskatchewan; when applicable, studies from the United States were also reviewed. Particular attention was given to authors who compared the returns from private woodlot management to farming.

Carruthers, P., The Prospects for Agroforestry: An EC Perspective. Outlook on Agriculture Vol 19, No 3, 147-153 (1990)

Agroforestry is defined as an approach to land-use and the management of plants and animals that 'fits' in certain circumstances, and which addresses particular needs or fulfils particular aspirations. It originated in New Zealand following the collapse of government subsidies to farmers, which forced farmers to initiate multiple-objective land use practices such as the *Pinus radiata/sheep* systems.

Agroforestry is seen as a means of avoiding the problems of overproduction, high costs of support and control measure implementation, and the associated decline in real farm incomes and rural employment that results from subsidization. The integration of agriculture and forestry in countries such as New Zealand shows how agroforestry can give higher overall returns than monocultures perhaps due to faster tree growth rates , more efficient use of natural and human resources, and better timber quality. Such systems tend to produce at least one high-value product (quality timber, nuts, etc.), and frequently address multiple objectives. For instance, provision of shelterbelts comprised of various species produces quality timber and also provide livestock with shelter, and soil with erosion protection.

Similar to the New Zealand system, the Spanish *dehesa* system combines management of an open oak woodland with livestock and periodic cultivation of crops (namely cereal crops) in arid lands. Most *dehesa* systems are privately owned 'farms' of 100-500 ha in size; although they have declined in recent decades they are now undergoing a resurgence in popularity as the EEC recognizes the need for agricultural diversification. Management practices involve maintaining low tree density (50-100 stems per ha) and pruning to provide fuelwood, charcoal, and acorns (for swine) while at the same time protecting the soil, improving fertility, and providing shelter; periodic grazing and cropping is also done to prevent scrub invasion. In addition to maintaining the land base for several different uses, the *dehesas* also provide hunting and recreation opportunities to Europeans.

Growing interest in animal welfare has also allowed a 'free-range' livestock industry to develop in Europe. The demands for animal welfare dictates the objectives of these demands can only be met by outdoor production. Agroforestry offers an approach to free-range poultry and pig production which can improve both economics and animal welfare but are not without problems. These are in reality traditional 'feudal ' methods of agriculture. More research and development is planned.

Other international experiments with agroforestry include Italy's attempts to intercrop soya and maize with poplar trees. Due to poor prices for wood, labour shortages, and a lack of research and development in this area, this practice is currently in decline; however, field evidence suggests intercropping with poplar provided better returns than mono-forestry practices.

The author concludes that given current trends favoring integrated approaches (which take into account social and the environmental concerns, the growing demand for countryside-based recreation, and concerns over future wood supply and demand), the circumstances seem favourable for agroforestry in the EC.

Coxworth, E. Agroforestry for Western Canada: Multiple Row Shelterbelts that Produce Timber and Other Products for Sale as Well as Providing Protection for Annual and Perennial Crops. Farm Woodlot Association of Saskatchewan and the Saskatchewan Research Council, Progress Report, March, 1991.

Possible economic benefits associated with wide (multiple row and species) shelterbelts along the boreal forest fringe are presented for both agriculture and agroforestry. An initial calculation, by Mr. Jim Johnson of Forestry Canada's Prince Albert office, showed that the value of timber products from managed and highly productive forest belts (estimated to be $314/hectare or $127/acre) was much more that the estimated return of $40/hectare ($16/acre) from existing aspen poplar woodlots. The study, however, looked at forest shelter belts consisting of Green Ash and Siberian Larch, with the desired product being lumber, and not pulpwood, assuming that agroforestry production would aim at higher value products. Markets for Green Ash and Siberian Larch are not, however, currently developed in Saskatchewan.

Computer simulations showed that a forest belt protected field would increase net farm income by $1276 for a 160 acre field. This assumed a wheat price of $3.50/bushel, and input costs for wheat production of $70/acre ($173/hectare). The increase in net income came from a projected yield increase of 7.2%, taking into account the 4.8% of the land placed into forest and shelterbelts. Increased yield and economic benefits were also estimated for barley and durum wheat.

The study also reported that Saskatchewan wood producers currently receive less than producers in other provinces, and that the price paid for aspen delivered to the mill was below the cost of logging and hauling the wood as either sawlogs or pulpwood. Other wood products, e.g. posts and rails, spruce/pine sawlogs and peelers had prices paid for wood delivered to the mill in excess of their logging and hauling costs (Harding, 1990).

Fautley, Ray. "Economic Returns to Private Woodlots Utilizing Aspen for Sale in Pulping." Conference Paper, Canadian Forestry Service, 1988

This paper represents an attempt to derive the "bottom line" answer to the question "will I make any money?" in managing private lands for forestry. It deals with the harvesting of aspen for pulpwood.

In 1981, Saskatchewan had 284 000 ha of private wood on 7 100 farms for an average of 40 ha per farm. Trembling aspen (white poplar) was the dominant species in 85% of these farms. The average 40 hs woodlot was estimated to have an average stand yielding 112 m^3/ha. Considering a 40 year rotation age for aspen, the sustained yield and thus the annual allowable cut would equal approximately 3 m^3/ha/year (112 m^3/ha divided by 40 years).

Fautley compared a harvest of barley versus aspen, using costs and prices existing at that time. He assumed that a farmer could harvest 106 bushels/ha versus 3 m^3/ha of aspen. If the price of barley was $1.00/bushel and the price for aspen $28.00/$m^3$, the net value of the aspen harvest would be greater than that of the barley.

Certain hidden costs associated with harvesting grain crops from marginal lands were not build into the bottom line calculation. These include:

- crop insurance premiums;
- costs of income stabilization programs, and
- need to summerfallow barley to avoid serious soil degradation.

Fautley argues these hidden costs could be avoided by keeping land in forest cover.

Federation des producteurs de bois du Quebec. Results of cost studies for pulpwood harvested on non-industrial private forest land. August, 1990.

Determinations of the cost of harvesting wood on private forest land in Quebec were made in 1987. Emphasis was placed on researching the harvest costs for softwood and hardwood pulp, sawlogs and firewood under actual conditions.

The consultants were able to successfully survey 137 woodlot owners, and accumulate cost information with a 90% level of confidence. They reported this information under three separate items:

- harvesting expenditures,
- renumeration of work performed by the owner and his family, and
- renumeration of captial investment.

Actual costs were reported for harvesting expenditures. Owner (including spouse) labour was valued at $13.45/hour, while other family members was valued at $10.00/hour based on the wages for agriculture workers. These rates were considered realistic, while below those paid to workers employed in commercial forestry. The rate of return to capital investments was assessed at 12%, while the return to the land base was assessed at 8%.

The study divided woodlot owners by size in the following groups:

- Class 1 producers harvested 10 to 50 cords in 1988,
- Class 2 producers harvested 51 and 150 cords in 1988, and
- Class 3 producers who harvested 151 cords or more in 1988.

Findings of interest include:

- the level of mechanization and the harvesting system utilized (full tree or shortwood) have much bearing on the harvest costs, with 100% of producers using chain saws for felling, and 72% utilizing the shortwood method of harvesting wood. For skidding and forwarding the wood from stump to roadside, 47% of producers use a farm tractor and 26% use a cable skidder;

- Class 1 owner-operator and family labour to produce a cord of pulpwood totalled 4.91 hours per cord, but declined to 1.71 hours/cord for a Class 3. Total time for salaried personnel and contracted out work increases proportionally in Class 3 woodlots. On average, 78% of the work is performed by the owner-operator and family;

- on average, owner-operators harvest 7% of their woodlot annually which equals approximately 8 hectares;

- Marketing Boards set the price for pulpwood in Quebec, and the 1990 price was \$118.57/cord (\$32.71/m^3). In constant 1980\$, the price for pulpwood has averaged \$65/cord (\$17.93/m^3) for the past decade;

- In 1988, the price for pulpwood was \$107.63 per cord (\$29.69/m^3). Harvest costs, based on the returns to labour, capital and land above, averaged \$99.47 per cord (\$27.44/m^3). Profit from woodlot operations therefore averaged over \$8 per cord (\$2.21/m^3).

Folkema, M.P. 1984. Handbook on high-capacity production and marketing of fuelwood. FERIC Handbook No. 6.

The importance of fuelwood businesses in the provision of local employment are recognized. Fuelwood businesses use local resources, serve the immediate community, and most importantly, keep money within the community; this contrasts favourably with heating oil industries which employ fewer people and result in the loss of roughly 80 to 90% of the price of heating oil to outside areas.

Canadian and American fuelwood consumption has been increasing at about 10% per year since the early 80s. Factors affecting fuelwood sales include:

- price of heating oil;

- number of installations of wood burning units (if units are installed, the owner tends to be committed and cannot take advantage of other systems even if prices more favorourable;

- legislation; for example, Canadian subsidy programs have favoured wood use;

- building codes (safety and storage requirements can lessen concerns); and

- environmental codes (some areas regulate atmospheric emissions from wood burning stoves)

Households that use wood as their main heating fuel burn ~ 3 1/2 cords/year; those that use use wood as a supplementary heat source burn about 1 1/12 cords/year, about 1/2 cord/year is used if wood is burned for enjoyment only. Meeting these demands for firewood requires the average producer in Canada and the U.S. to market approximately 200 - 300 cords/year. This is most efficiently done by:

- using mass-production techniques (i.e. use of a semi-automatic firewood processor). This is important, since firewood production is labour-intensive, hence, its price usually becomes too high if normal wage rates are paid

- purchasing fuelwood logs from a local logger to avoid substantial start-up costs, such as the purhase of skidders, loaders and trucks for log transport;

- harvesting selectively for fuelwood to avoid destroying the future crop of sawtimber by taking:

    - diseased, dead and dying trees;
    - weed trees;
    - those crowding the final crop;
    - windthrows and damaged trees;
    - crooked or leaning trees;
    - large crowned; short boled trees; and
    - trees stunted due to overtopping.

- marketing and promoting fuelwood for sale using a variety of different media.

Green, J.L. and K.A. Blatner. Identifying woodland owner characteristics associated with timber management. Forest Sci. 1986 Vol. 32, No. 1:135-147.

A 70% success rate at separating timber "managers" from "non-managers" in Arkansas was achieve using discriminant analysis. Those who managed their timber tended to:

- have contact with a forester;
- farm; and
- be well educated.

"Non-management" tended to reflect personal objectives of landownership (i.e. some woodlots were being held as undivided estates and others for real estate speculation).

Two main conclusions arose from the study:

- management assistance programs aimed toward developing non-timber forest outputs, specifically grazing and wildlife and recreation, might yield more managed acres than strictly timber-oriented programs, and

- personal contact by a forestry professional might also influence many woodland owners to become timber managers.

Griffiths Muecke Associates and Turnkey Solutions Computer Consulting Services. 1989. Participation in the private lands management program: a survey of Nova Scotial woodlot owners. Prep. for the Nova Scotia Dept. of Lands and Forests and Forestry Canada.

Approximately 4000 woodlot management plans were prepared for individual landowners in Nova Scotia between 1982-89. This Private Lands Program offers:

- assistance in the form of free management plans;
- 100% funding for silviculture treatments; and
- cost-sharing for services (e.g. roads and boundary lines)

Landowner participation rates varied across the province: in the northeast, 20-21% of landowners participate in a Private Lands Program; elsewhere in the province, participation in the program ranged from 13-17%. Of program beneficiaries, only 58% of the participants were considered 'performers" (i.e. had a plan and had made a claim for at least one silviculture treatment); over 91% of these performers were found to have acted within 2 years of receipt of the plan; in contrast, 91% of non-performers had held their plans for 2 years or more.

Both groups identified "making money" from their woodlot as important, but cited other benefits as more important, i.e:

- personal use, recreational and wildlife benefits often superceded other benefits; and

- about 40% of woodlot owners were explicit that they were not interested in growing wood for pulp companies.

Significant attitudinal differences between the "performers" and the "non-performers" were detected in only one area:

- non-performers tended to see woodlot management primarily as a hobby, whereas

- performers tended to believe that woodland that isn't being managed is wasted.

Government administrators believe participation would increase if staff had more contact with owners. Recommended changes to the Program included:

- Provincial staff should meet regularly to
  - share experience and information;
  - schedule and follow up contacts with woodlot owners; and
  - clearly define the program's purposes and woodlot owner responsibilities

- program users part should be made part of a regular consultation process.

- the 'management plan' should be replaced with:

  - general recommendations for silviculture; and
  - a full scale plan following commencement of silvicultural work;

- eligibility for program assistance should be tied directly to completion of silvicultural work; and

- the Department should establish a quality control program and establish an Award program for 'excellence in woodlot management'.

Hallmark Engineering Ltd. 1983. A study of Alberta's secondary forest products manufacturing industry. Joint publication of Forestry Canada and the Alberta Forest Service.

Alberta's secondary manufacturing sector was found to provide direct employment for about 5500 people, and to have an annual sales volume in excess of $400 M, making the industry more important in employment terms than the primary wood industry. However, most of the industry was found not to be based on the Alberta forest resource, but is instead dependent on imported raw materials from other provinces, the U.S.A. and overseas.

Nine main industry sectors were identified that use imported lumber. These included: Cabinets; doors; furniture; manufactured homes; millwork; relocatable structures; remanufactured products; trusses and windows. Some concern was expressed with regards to possible over-capacity in the millwork, cabinetry, and standard trusses sub-sectors; however, growth potential was seen in the areas of windows, doors, furniture and kitchen cabinets.

The study concluded that North American markets have the potential to support the following goods from Alberta forests:

- unfinished pine furniture;
- interior shutters
- laminated boards;
- interior panelling;
- mechanically stress rated (MSR) lumber; and
- lumber in home centre sizes.

Johnston, Jim. "Diversification of Agriculture in Saskatchewan: Some Selected Examples." Conference Paper, Canadian Forestry Service, 1988.

Arguments are made in favour of diversification of farming through private land forestry. Two needs must be met to facilitate this:

- forests on private land must be considered as a crop; and
- markets must be found for forest products.

Opportunities for economic returns are demonstrated provided standing wood is not viewed as a waste product. For example, the selective harvesting of a stand of trees for saw timber could generate $9,000 cash to a farmer, possibly on a 10 to 15 year rotation. Another farmer was offered $0.55/m^3 ($2 a cord) for poplar as pulp, but was able to find a buyer for his trees as poplar building logs at $16.55/m^3 ($60 a cord). Christmas trees grown in Saskatchewan represent a $2 million a year business.

Massie, M.R.C. et al. An economic strategy for managing aspen on private lands in northeast British Columbia. FRDA Report 124, Forestry Canada, June 1990.

Discusses some of the basic information necessary to consider the management of aspen on private land as a crop that would provide diversification benefits where agriculture is marginal.

This report considers private land situations in which woodlots range in size from 80 acres (32 ha) to about 1 000 acres (400 ha) and harvested in blocks from 10 acres (10 ha) to 40 acres (16 ha), with harvesting for pulpwood on larger woodlots (greater than 160 acres or 65 ha) every five years. This rate of harvest assumes that the woodlot is producing a net mean annual increment of 3.4 m^3/ha. Trees in such a stand would be between 60 and 70 years of age, and not suitable for sawlogs in the B.C. market.

Total costs ($/m^3) for felling, skidding, bucking and loading a cubic metre of pulpwood for the Dawson Creek area of British Columbia were estimated to range from a high of $13.00/m^3 for a firm or farm with limited experience down to $11.75/m^3 for a large logger or contractor with a feller-buncher, grapple skidder and wood processor. Aspen hauling costs ranged from $4.00 per m^3 when the harvester was within 20 kilometres of the mill to $9.00 per m^3 if the distance to mill was 91 - 110 kilometres. Other costs added a further $0.50 to $3.75/m^3 (predominantly stumpage fees) to the total costs of producing aspen on private lands.

The delivered mill price ranged from $18.93 to $23.03 per cubic metre for contractors depending on haul distance, while the price paid under an open gate policy for "local" wood was $20.98/m^3.

Conditions necessary for aspen management on private land include:

- Location - the closer the woodlot is to a mill or purchasing point, the higher the value of stumpage or standing timber as the viability of an aspen woodlot as the cost of trucking the wood is a significant cost component;
- Size - in general, larger woodlots have some advantages - woodlots from 160 acres to 1,280 acres (65 to 518 hectares) appear to be the most practical; and
- Stand Conditions - i.e. whether or not the stand is fully mature or overmature, or of low volume or poor quality.

For the Dawson Creek area, which is generally considered marginal agricultural land, the report found that the "average" grain operation is uneconomic, that is, the net present value of the operation is negative. Annual pre-capital net income is only about $14,000, although owner labour can capture a further $15,000 annually. By comparison, aspen production on a medium site without owning machine capital, could return pre-captial (land) farm net income of $3,900 plus an additional $9,500 in owner labour.

The report concludes with a range of market prices needed to provide the woodlot owner with a real rate of return of 6%, a profit considered large enough to induce management of a woodlot versus the landowner's next best alternative. Large woodlots (those greater than one section of land) with medium quality trees immediately adjacent to a purchaser would require between $18.20 and $20.20 per m^3. Small woodlots with only fair quality trees immediately adjacent to a mill or other purchaser would require between $19.85 and $21.85 per m^3. Each scenario assumes harvesting costs ranging from $11.00 to $13.00 per m^3. Transportation costs start at $4.00/$m^3$ and generally increases by $1 for every additional 10 kilometres the pulpwood must be transported. In all cases, the difference between the cost of harvesting aspen and the delivered price at the mill must be greater than $7.00 per cubic metre.

Millar, Jack. Plugging into the power of wood. The Globe and Mail. Feb 02/91.

Forests planted and harvested for the purposes of fuel (i.e. 'energy plantations') are an environmentally neutral potential source of continuous energy;

Ontario Hydro has demonstrated that producing electricity from wood would cost three times as much as producing it from coal if conventional combustion techniques are used; new technologies (e.g. Ontario's BAR TURBINE) designed to burn wood and other biomass material can produce 200 000 watts of electricity and no smoke byproducts;

Other Canadian wood-burning energy initiatives include:

- a 60 megawatt, $100 M wood-fired power plant at William's Lake, B.C.. This plant will burn 600 000 tonnes of sawmill waste per year, or 85% of the waste currently burned in beehive burners by the area's mills. In addition to producing energy, the plant will operate at one-fifth the particulate emission level set by the province.

McElweee, R.L. and O.F. Hall. 1982. Cultural, management and economic research needed to assist the non-industrial private forest landowner in the southeastern U.S.-a problem analysis. Publication No. FWS-5-82, School of Forestry and Wildlife Resources, Virginia Polytechnic Inst. and State Univ.,Blacksburg, VA

Specific economic concerns deter landowners from making commitments to regenerate forest lands and to manage their properties for continued forest production. As rational land managers, landowners will act to enhance

production 'only if the financial resources committed offer promise of returning a financial yield at least equal to alternative investments'. Economic factors that may deter or induce landowners to manage their forest resources may be classified as follows:

A. Taxation Policies
- Capital gains taxes;
- Estate and Gift Tax Credits; and
- Property taxes

B. Management Costs
- Capitalization and expensing management costs; and
- Cost-sharing (e.g. federal and provincial incentives)

C. Market Stability
- Demand; and
- Stumpage prices

Madigan, G. and A.R.C. Jones. 1981. The private forest owners of eastern Canada - a survey. Silva Fennica Vol. 15. pg. 65-72

Rural residents were surveyed to identify woodlot owner characteristics. Relevant findings included:

- majority of rural landowners do no use forestry assistance programs;
- hose who use programs found them satisfactory;
- most respondents were middle aged and lived near active communities and close to their lands which were largely forested;
- the size of woodlots was usually 76-100 acres.

Notable features of several provincial woodlot assistanceship programs include:

The Woodlot Improvement Act (Ontario; 1966)

Owners of ≥ 5 acres for forest land are eligible for assistance, provided they sign a contract and agree to manage land for a minimum of 15 years for protection from fire, disease, insects, and grazing. In return, free planting stock, timber stand management , harvesting and marketing assistance advice is available.

The Managed Forest Tax Reduction Scheme (Ontario; 1975)

Landowners with ≥ 25 acres of forest land registered under a woodlot improvement act agreement or managed according to a plan developed by a registered forester are entitled to a grant equivalent to 50 per cent of municipal, school, or local road taxes.

Forestry Merit Award (Quebec, n.d.)

Cash awards of $500 - $1500 are awarded in recognition of outstanding efforts in managing private land forestry plantations, natural forests and maple stands; these totaled $27,000 dollars in 1979.

Groupement Forestier Program (1972)

Woodlot consolidation "partnerships" are achieved by combining four individual operations into regional forest management units; incentives are provided in the form of start-up grants and diminishing opertions funds. The goal of the program is to stimulate local economy and provide employment.and increase forest production.

Credit Forestier Act (Quebec 1976)

Woodlot owners receive credit based on the value of their forest land and on submission of an approved forest management plan. Long-term and short-term loans, guaranteed to 90% of the valueof the woodlot are offered to eligible recipients; loaned money can be used to consolidate forest lands, buy machinery, improve woodlot, plant stock, etc.

Repayment schedules for long-term loans can be extended over 60 years. Credit is provided up to a maximum of $40,000 for individuals, and to $500,000 for a company.

Christmas Tree Program (New Brunswick, n.d.)

Provides financial assistance up to $80 dollars per acre for a maximum of 10 acres per year.

Woodlots Road Program (New Brunswick, n.d.)

Provides financial assistance to woodlot owners having an approved management plan. Owners provide labour and/or cash upfront to cover construction costs for access roads to woodlots and Xmas tree farms. The program provides coverage for up to 40% of machinery costs of road building to a maximum of $1000 dollars yearly. Coverage was increased to 60% in 1978.

Major recommendations arising from this study were:

- woodlot assistance programs should be evaluated in view of the amount of public money invested in them;
- precise guidelines for aid programs are required to attract participation of younger landowners in woodlot management programs; and
- guidelines are required to increase forest production on "neglected woodlands"

Meeks, G. Jr. 1982. State incentives for non-industrial private forestry. Society of American Foresters.

This report suggests that tax legislation is the most extensive method used by the States to encourage management of non-industrial private forests. Taxes are frequently called the primary disincentives to non-industrial management for timber production.

Incentives, primarily in the form of property tax relief, are provided by 22 of the States in the U.S.A. Tax relief is determined by assessing woodlot value on the basis of use, rather than on its market value. The system also provides various means of deferring timber taxes. Few states provide cost-sharing or other direct financial incentives other than technical assistance programs.

Rensema, T. R. and Tuskan, G. A. 1988. Wood utilization from managed field windbreaks: a modelling study. Journal of Soil and Water Conservation.

Empirical models were used to evaluate the utilization of finished wood products from harvested windbreaks. Proper species selection and management, along with application of available incentive programs, demonstrated landowners could produce present-value revenues that exceed the present-value management costs associated with harvesting wood from a windbreak, based on a 4% real discount rate.

Three economic incentive programs were examined separately and in combination to determine their effect on investments in windbreaks. The incentives were:

- Tax exemption allowing planting costs to be completely written off when costs occur. This study used a tax discount rate of 15% for planting, thinning, spraying, improvement costs. Revenues were taxed at 15% when products were harvested;
- Cost sharing is available to landowners who establish and maintain windbreaks. 75% of planting cost was subsidized in the study and payments were considered income; and
- Property tax reduction of $1/acre of windbreak per year or $3/acre of windbreak per year depending on the species.

Three controls and three combinations of hedgerows of scotch pine, bur oak, and green ash, and ponderosa pine were analyzed at different discount rates. Scotch pine harvested for Xmas trees was the only case with positive net present value, although the net present value of all other harvested cases were less negative than those of non-harvested controls at 4% discount rate.

Each incentive program was found to have a positive effect on the net present value for all species and the best case in each species was with all incentives applied. Cost sharing had the greatest effect on net present value, nearly double that of property tax reduction. Therefore, it was concluded that it is beneficial for landowners to manage and harvest windbreaks for wood product production.

Rosen, B.N., Kaiser, H.F. and M. Baldeck. 1989. Nonindustrial private forest landowners of timber marketers: a field study of search for market information and decision quality. For. Sci. 35(3):732-744.

Timber marketers from the non-industrial private forest (NIPF) tend to engage in a limited search for infomation from poor sources, compared with those normally consulted by "experts". Of the study group:

- 79% consulted only one source for price data;
- 16% consulted independent sources (eg private or government foresters);
- 17% consulted consumer-oriented personal sources; and
- 4% consulted printed independent sources of price information (e.g.NYStumpage Price Report).

A significant positive relationship between the importance of earning income through timber marketing and search quality was demonstrated. Owners who solicited competitive bids considered timber marketing to be significantly more important to their ownership objectives than those who did not. However, those owners who negotiated with one buyer were more self-confident in negotiating price than owners who solicited competitive bids.

As a group, NIPF owners who consulted interpersonal sources for price information tended to be less concernced about timber marketing and income from their ownerships. They place less importance on price as a factor in harvesting and are less confident in negotiations than those who did not consult friends and neighbours.

Past efforts to assist NIPF owners had concentrated on simply getting them to harvest. It was apparent that this alone did not promote better landowner decisions. Recommendations for future NIPF education efforts included:

- increasing owner awareness of the returns to better search and decisions;
- informing owners about the availability, role and value of alternativesources of information; and
- teaching owners to use that information.

Silvacom Ltd. 1988. Shingles and shakes from Alberta jack pine and aspen - a feasibility study (No. 16901). Canadian Forestry Service and Alberta Forest Service.

Prototype aspen and pine shingles from the Lac La Biche area were evaluated and subjected to preservative CCA treatment. The resultant product was not suitable for roofing applications, and would require numerous changes to make the product work. Most of the problems related to the quality of the shingles: knots and insects reduced the value of the shingles, and poor dimensions reduced their utility. There is a need to develop a product exhibiting increasing thickness, tapering and width control.

Shake production has better potential to be a high value added product and contributor to the regional economy. In particular, taper sawn shakes were

found to have good potential for roofing, but require building code approval before they can be mass marketed. The necessary approval could be achieved via proxy of a CMHC building material evaluation report (more easily obtained for pine than aspen).

Recommendations that came out of this study included:

- a recommendation to develop pine shakes before pursuing aspen; and
- a recommendation to start a "Shake Development Program" to assist the establishment of the industry.

Steele, T. and T. Williamson. 1986. The continuing challenge: competition and new products in the world forest products market. Prep. for Forestry Canada. Forest Resource Development Agreement Proj. #2795-8.

This document summarizes the contents of a series of papers presented at the Resource Information Systems Incorporated Annual Conference. Papers focussed on the effects of competition, new product innovation, and changes in world markets on the global forest industry.

Several presenters expressed concern with respect to the impact on the North American forest industry from growth in non-traditional suppliers in Latin America, Asia, Africa, Oceania, and parts of Europe and the U.S.S.R:

- Non-traditional producers are expected to gain increasingly larger shares of world forest products trade given the high productivity of their respective land bases and relatively low cost of labor;
- Plantations are expected to contribute an additional 100 M m3 per year of pulpwood supply by the year 2000; however, this is not seen as a threat to North American pulpwood markets given the high costs of transportation and the low value to weight ratio associated with the export of logs;
- Underdeveloped countries are also unlikely to compete successfully against traditional suppliers of value-added products (i.e. bleached softwood kraft, newsprint, printing and writing papers) given that the wood cost share of sale price is not significantly different between traditional and nontraditional suppliers, and that consumers are expected to continue to demonstrate preference for high quality products from traditional supply areas.

Demand for fibre products is anticipated to show both growth and decline in specific market sectors. In Canada, development of the aspen resource, and development of oriented strand board (OSB) and medium density fiberboard (MDF) products is expected to strengthen Canada's position. Demand for Canadian structural panel products is forecast to grow 43% to 6.6 F ft2 by the year 2000. In contrast, plywood demand is expected to decline, and a general decline in the hardboard market is expected due to increased product substitution favouring the use of non-wood materials or lower grade fibre

inputs. Weak demands for U.S. timber exports were projected throughout the 1990's for the following reasons:

- demographic shifts are expected decrease construction starts on new houses;
- overseas log markets are expected to decline in Japan, but may grow in China;
- global panel production will increase, diminishing the U.S. panel markets;
- technological change will lead to better utilization of high quality timber;
- international development in paper and board markets will increase competition; and
- the paper industry will shift to value-added products over expansion of production.

Wengert, E. M. 1988. Utilization and marketing opportunities for Alberta aspen solid wood products. Canadian Forestry Service and Alberta Forest Service.

Aspen was identified as the most underutilized resource in Alberta and North America due to industry requirements for new technologies for aspen use which have been slow to come on stream

Possible categories for aspen use include:

- high product value categories. These tend to have high manufacturing costs and require high quality trees and substantial market development;
- Construction 8/4's. Product yield tends to be low, and to have low market value. Industry trials have been largely unsuccessful;
- Utility lumber 4/4's. Aspen has moderate to high potential to yield high quality logs (>24cm dbh) for these purposes. More research needs to be conducted to find profitable uses for residue;
- Furniture parts. These are high value items that have high potential for medium and high quality logs. More effort needs to be expended in developing the market;
- Pallets.--These are high potential items for which active markets already exist in Alberta. Could be especially profitable if uses are found for residue;
- Fuel. Aspen has low potential for industrial use due to its low weight per volume; small logs (<24 cm) may be suitable for briquet manufacturing;
- Animal feed/roughage. Small logs (<24cm) offer the best potential for this use; A need for more research in this area was identified.

• Other possible uses for aspen include wood flour, wood wool, snow fencing, log cabin logs, veneer products, pulp, and particleboards. Large logs (> 24 cm) offer the best potential as furniture parts and pallets, and have moderate potential as 4/4 and 6/4 lumber.

Wetton, C.E. 1988. A survey of private forest land owners in British Columbia. Prep. for Forest Resource Development Agreement. FRDA Report 044.

Approximately 56% of the private woodlot owners control >70% of BC's private woodlot lands. Within this group, forest management objectives primarily concentrate on harvesting activities:

- about 75% of forest land owners had undertaken some form of harvesting activity in the preceeding 10 years;
- only 8% of forest landowners had undertaken tree planting or site preparation activities in the same time period;
- harvesting activities remained the most important activity forecasted for the next 10 years, but increasing importance was placed on planting and site preparation.
- about 10% of forest land owners surveyed did not intend to carry out any forest activities during the next decade.

The following major obstacles to forest land management were identified:

- high capital expenses (for tree planting and stand tending, land preparation, equipment hire or purchase and labour);
- lack of markets for minor products and pulp; and
- lack of marketing assistance.

Other constraints that were thought to be relevant included:

- lack of incentive on the part of landowners to invest in programs with long pay-back periods;
- landowner reluctance to change traditional behavioural practices (i.e. land clearing);
- prolific data requirements by BC's Ministry of Forests and the BC Assessment Authority;
- landowner disqualification from provincial assistance eligibility due to 'non-availability of quota'. To meet the quota requirements that would enable landowners to access the finacial assistance necessary to promote investment in improving their forest resource, cutting rights in addition to private lands may be required;
- difficulties in getting professional foresters to assist with small landholdings; and

- unfavourable taxation schemes, including:

  i) high personal taxes leaving less money available for investment in forest management;

  ii) a provincial property tax system based on 'unrealized value' instead of 'income';

  iii) a capital gains tax system which discourages land improvement (only 10 ac exempt from capital gains). i.e., to avoid higher taxation, it is better to leave land undeveloped.

With respect to marketing assistance, landowners were demonstrated to need the following information:

- specifications with respect to species, quality, lengths and breadths of desired timber, and
- better knowledge of desired end products (e.g. poles, pilings etc.).

Woodbridge, Reed and Associates. 1988. Canada's Forest Industry - the next twenty years: prospects and priorities. Prep. for Government of Canada, Canadian Forestry Service, Industry, Trade and Technology Directorarte Economics Branch, Ottawa. 6 Volumes.

Major findings from - of the six-volume set are presented below. Emphasis has been placed on extracting information relevant to the prairie provinces, and Saskatchewan in particular.

Volume 1: Strategic Analysis

The prairies represent a major growth potential for the Canadian forest industry for the following reasons:

- further capacity growth in the east and west is constrained by softwood fibre shortages; prairie provinces will be able to supply growing US markets, but will be disadvantaged with regards to overseas market opportunities;
- hardwood surpluses will cultivate growth in BHKP and CTMP pulp, and higher valued end use printing papers made from aspen.

However, for capacity growth to occur, basic infrastructure links (transportation and energy) are required; i.e. the commitment and financial contribution of a wider range of parties is essential to development of this resource.

Volume III. Pulp and Paper.

Projections for the future of pulp and paper, newsprint and other paper products manufactured in the prairie provinces are summarized below:

1. Pulp and Paper

Use of woodpulp as a component in the manufacture of paper and paperboard will increase, but at a declining rate of growth. More recycled fibre and fillers will be used to reduce production costs and provide more variety in finished paper products. The prairie provinces are expected to see a general increase in pulp and paper production, primarily in BHKP (bleached hardwood kraft pulp) and CTMP (chemi-thermomechanical pulp) grades which utilize hardwoods. Manufacturers are expected to accelerate the search for lower cost raw materials and new technology. In Saskatchewan, slight reductions in the volume of pulp and paper produced at Prince Albert's Weyerheuser mill are predicted.

2. Newsprint

Relatively low electricity and fibre costs combined with weak currency enables Canada to maintain a competitive position with the U.S. and Nordic countries. Rising wood costs will force technological changes and installation of higher-valued pulp based printing and writing paper machines. The inability of BC and Quebec to meet newsprint demands in the U.S. Midwest are expected to promote some growth in capacity in the prairies.

3. Other Paper Products

Modest growth is projected in the demands for printing and writing paper, containerboard and kraft packaging, and miscellaneous paperboard products (i.e. various construction boards and tube, core and drum material). However, virtually no expansion in capacity is required to meet these demands.

Volume IV: Wood Products

Softwood demands from major importing regions (China, Japan, Europe and the U.S.A.) are expectedto increase incrementally in the short and long-term (to 2010). For Canada, this is interpreted to offer a significant growth opportunity, representing an increase of close to 30% by 2010 over 1985 levels. Canadian response to this increased demand has been faster than anticipated, and the potential further growth outlook is somewhat less dramatic than that indicated.

Alberta produces approximately 85% of the lumber in the prairie region; the majority of this is milled in highly efficient, high volume and low cost mills. Elsewhere on the prairies, limited log size and numerous small forest quotas make it uneconomic for individuals to invest in modern facilities and high-tech equipment. Few locations exist which would permit the amalgamation of several quotas into a cooperatively owned and operated facility which may have the chance of benefitting from economies of scale.

Despite the significant volumes of unutilized aspen throughout the prairires, growth in market opportunities for this product are considered limited. Opportunites for a few small, highly specialized operations may exist. Those who may be able to exploit this resource will require:

- a good supply of relatively defect-free aspen; and
- establishment of a satellite plant near a major aspen user.

Volume V; Fibre Assumptions

Total annual allowable cuts for softwood and hardwood in Saskatchewan are 3.3 M m3 and 3.1 M m3, respectively. Surpluses exist for both types of fibre: estimated softwood suplus is 1.1 M m3/year, and 2.0 M m3/year for hardwood. Regional shortages of sawlog quality timber (softwood) occur in some areas close of wood product plants. To meet the size and quality requirements at existing sawmills and the one veneer/plywood plant, larger logs must be sorted from woods-run pulpwood and transported long distances across the province. There are no apparent regional hardwood shortages, given there is a relatively large surplus of aspen in each of the industrial zones. Future increases of economically accessible fibre reserves in the Prairie provinces depend on the expansion of road systems and other infrastructure into the currently inaccessible northern forests.

APPENDIX B

FWAS LANDOWNER SURVEY - SUMMARY

SUMMARY OF LANDOWNER SURVEY - RESULTS

PART A. PRESENT LAND USE

All but one of the FWAS survey respondents owns the land on which their farm woodlot is located; a further 7 respondents (33% of the sample) rent or lease additional land. Total land holdings were found to vary considerably, from a minimum of 60 acres (~ 23 ha) to a high of 2280 acres (890 ha); average land holdings approximated 500 acres (~200 ha). Three-quarters of the respondents (16 persons) cultivate a significant portion of their land; these individuals are almost exclusively grain farmers only. The few respondents (4) who raise cattle keep livestock for sustenance purposes only.

The size of individual woodlots was also found to vary considerably, ranging from a low of 35 to a maximum of 530 acres in size; the average woodlot size was approximately 200 acres. As a percentage of total land holdings, woodlots varied from less than 2.5% of the land area, to a single case in which the entire land area was "bush". Assessments of the quality of the wood fibre on individuals woodlots was difficult to make, given the subjective nature of the question. However, muskeg, swamp and scrub or brush was found to occupy a significant area (> 25% of the woodlot) in 7 instances, suggesting the wood quality may be a genuine concern facing a number of Saskatchewan's woodlot owners. Aspen, poplar and spruce were identified as dominant species on almost all of the woodlots, although there was considerable variation in the proportions of each of these species present on individual farms.

PART B. ATTITUDES AND WOODLOT MANAGEMENT HISTORY

All of the survey respondents expressed interest in increasing their benefits from their woodlots, and almost all those surveyed desired to learn more about various aspects of woodlot management. Specific areas of interested included, in declining order of frequency: maintenance of wildlife habitat; soil and water conservation; expansion of forest resource; planting of shelterbelts or replacement of lost trees, and, lastly, recreation opportunities. A few additional areas of management intent

were proposed by individual respondents, namely Christmas tree production, wild food production and "aesthetic" concerns (unspecified).

Woodlot owner's awarenesses of marketing opportunities for their forest resources varied depending on the type of wood product under consideration. The most frequently cited marketing opportunity was for fuelwood; approximately three-quarters of the survey respondents (15) were aware of fuelwood marketing opportunities in their local area; somewhat fewer were aware of opportunities for marketing sawlogs, pulpwood and posts and rails, respectively. Responses to the question regarding marketing opportunities reflected the constraints imposed by the physical location of the woodlot with respect to existing markets: 15 respondents lived further than 50 miles from a mill or processing plant, and one was located more than 200 miles from a potential wood market.

However, while the question on marketing awareness identified that the majority of woodlot owners knew of marketing opportunities in their area, only one of these individuals indicated they had ever sold any of their wood fibre: 13 owners had never cleared any of their woodlot holdings; another 6 had cleared small parcels of bush over the last 50 or 60 years, but most had not attempted to salvage or market the timber; the remaining one individual was marketing sawlogs and peelers and obtained >10% of his income from his woodlot. Twelve persons indicated they do not perceive their woodlot as having any potential as a source of income at the present time, but nine individuals thought that it may have some importance in the future as an income generator. Unfair pricing strategies and lack of access to markets was only two of a number of reasons cited why wood from private lands is not being sold. Individual comments revealed that woodlot owners value their resource for a variety of reasons:

"I'm interested in woodlot management for recreation, *but not for profit* ";
"I'd be interested in people removing dead trees without charge";
"I'd like to use my woodlot for hunting and hiking. Crop production is already in a state of overproduction and subsidy wars"; and
"My forested land is priceless. Now than I own it, it has no monetary value".

PART C. PERCEPTIONS ON THE VIABILITY OF WOODLOTS, AND THE ROLE AND EFFECT OF GOVERNMENT POLICIES ON FOREST RESOURCES

A number of the questions in the FWAS landowner survey were of an open-ended type. Almost all of the respondents shared their views on the role of government in managing the province's forest resources, and on the effects of policies and agreements which grant industry the right to harvest trees off crown land. Typical comments included:

"The role of the government should be advisory";
"The role of the government should be to provide extension and interim support/incentives";
" 'wheat is King' attitude puts agricultural interests over forestry; private woodlots have been targeted for the bulldozers";
"Agricultural policies encourage more acres in crop production. Forest land is bulldozed to increase grain quotas";
"Current regulations leave no incentive for mills to buy private wood".

There was almost unanimous agreement amongst survey respondents that the private woodlot industry is not sustainable under the present situation; however, views were split with regards to the long-term future of the industry. Prevalent attitudes included comments such as:

"Small-scale management can create the most productive woodlands possible";
"They (woodlots) have the potential to be renewable but are not now due to economics";
"Industry cannot rely on woodlots to provide all wood requirements on a long term sustainable basis. They will develop their own regenerated forests on their leases"
"Woodlots are 'not big enough' to be economically viable" and
"Industry views private forest as a cheap, one-time source of fibre which will then be put into farmland".

Comments provided by survey respondents also included the following recommendations for change at the administrative level:

"Change the acre/quota system to preserve marginal land";
"Get government to assist private foresters with reforestation and site preparation; make equipment available for use by small operators"
"Require mills to pick up private wood first at a better price"
"Change FMLA structures to specify that a percentage of wood must come from private woodlots (if available)" and
"Set realistic stumpage on crown wood".

APPENDIX C

HARDING'S REPORT

TAEM

SASKATCHEWAN FARM WOODLOT ASSOCIATION

NIPF WOOD SUPPLY

DESCRIPTION AND ANALYSIS

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1.0 INTRODUCTION

1.1 History

Private Forest land management is Saskatchewan has experienced only limited development. The forests of central Saskatchewan have been historically viewed as an obstacle to agricultural development. Hundreds of thousands of acres of productive forest land has been cleared and burned in order to prepare that land for grain production. Land clearing continues, but at a much reduced rate than that of previous decades.

New pulpmills for the province have been announced or are in the planning stage. Expansion of the Prince Albert pulpmill has been completed. Markets for primary forest products have been created and will grow considerably as the new mills go into production. In some areas of the province considerable pressure on the commercial forest resource is forecast if all expansion and development plans come to fruition.

The Saskatchewan Farm Woodlot Association was organized in order to take advantage of the developing opportunities. In February, 1989, the founding meeting for the woodlot association was held in Prince Albert. The objective of the association is to promote private forest land management and, for private forest landowners to collectively become a reliable source of primary forest products.

1.2 Forests - General

The Farm Woodlot Association of Saskatchewan recognizes that we live in an interdependent world and cannot approach the subject of forestry without some understanding of global political, social and economic forces. It has only been in recent years that the rapid and accelerating rate of world forest cover loss has received widespread international attention. The extensive loss of global forest cover is speculated to be the root physical cause, along with industrial pollution, for world wide disruptive climactic change. Forest cover loss has not been limited to the "Third World", but is pervasive in the vast majority of nations, including "Canada". The loss of forests through neglect and inadequate forest management programs has already impacted on industrial and non-industrial countries. The consequences of this historical and continuing abuse of the worlds forests are global.

The nature of forest management dictates that planning horizons must be long term. However, attempts to forecast social and economic conditions decades into the future is fraught with difficulty, for ours is a rapidly changing world--one in which relationships between nations are very fluid. National alignments and friendships seem to lack the permanency of past eras when the world was less a "global village: than it is today. Tension among the superpowers, disputes between neighboring nations and domestic or civil unrest within nations does not allow assumptions to be made about the future with a high degree of confidence.

However, industrial forest management planning horizons are long term and should be based upon predictions of future wood fibre demand.

One method of estimating future wood requirements is to project trend lines that are based upon historical consumption patterns. The F.A.O. developed a consumption model and projected world wood demand to the year 2000 and beyond. A number of corporations and forest product marketing agencies have developed North American models. All consumption models indicate a continuing and increasing demand for fibre based forest products.

It is apparent that the demand for consumptive and non-consumptive products from our forested lands will continue to increase. At the same time the productive industrial wood demands on a shrinking forest base is already manifesting through industrial timber deficits coupled with an increasing frequency of land use conflicts and disputes.

Our neighboring province of Alberta is, at this moment experiencing massive protests by environmental groups against a number of proposed pulpmills. In our own province of Saskatchewan, the permanent closure of the Simpson Timber Company sawmill at Hudson Bay has been announced due to lack of adequate wood supply. One hundred and sixty direct and dozens of indirect jobs will be lost.

The Farm Woodlot Association recognized that society demands numerous and often conflicting products or benefits from its finite forest land base. The Association also recognizes

that to satisfy the needs or demands of all competing interest groups in a land use dispute is an impossible task. Trade-offs and compromises have to be made among resource users. Firm and enlightened forest land use policies must be established along with improved forest management programs. Forest management implies management and protection for the multiple and integrated use of forest land, e.g. water, wildlife, fish, recreation and timber.

The forested areas in Canada, which are the subject of the vast majority of land use and environmental disputes, are public lands. These disputes result because of an increase in awareness and concern by the public about environmental issues. Because Canadians are demanding a multitude of products, other than wood fibre, from public forests, the security of the long-term industrial forest land base is threatened. It is this public forest land base upon which the majority of Canadian forest companies are dependent. As in the rest of Canada, forest based industries in Saskatchewan are dependent upon public forests for their wood supply.

Saskatchewan has not yet experienced the scale or intensity of environmental and land use disputes that are now prevalent in the provinces of British Columbia and Alberta. However, conflicts will intensify one the full Saskatchewan economic allowable harvest on public lands has been committed.

There is another zone in Saskatchewan that is now recognized as containing a substantial but largely unexploited forest resource. The forest resource in this area, the non-industrial forest zone, is primarily located on private deeded land.

The benefits of developing an alternate source of industrial wood supply in Saskatchewan should be considerable. Firstly, there would be an increase in income for farm families. Secondly, there would be reduced pressures upon the public commercial forest base for industrial wood.

Privately-owned and managed forests, as compared to public forest, would not be subject to the same degree of scrutiny or political pressure with respect to land use allocation or zoning. With proper development, non-industrial private forests could become a highly values and reliable source of industrial wood as well as other consumptive and non-consumptive forest based products.

The report that follows is an attempt to assess the potential for Farm Woodlot management in the province of Saskatchewan.

1.3 Study Objectives

This study is an analysis of non-industrial private forest (NIPF) land located in the non-industrial forest zone (NIFZ) of Saskatchewan.

The objectives of the study are to :

1. Identify, using satellite imagery, forest cover on private deeded land that is ten hectares and greater in area.
2. Estimate the Growing Stock Volume of wood fibre existing on non-industrial private forest land.*
3. Estimate an annual sustainable harvest of wood fibre from non-industrial forest land.

2.0 LAND TENURE

There are two adminstrative district zones in the province of Saskatchewan that have large areas of forest cover. The largest area carries the land use designation "commercial Forest", and is administered by the Department of Parks and Renewable Resources.

The second area lies south of the commercial forest zone and is a mixture of agricultural and forest land. This general area extends across the province in a southeasterly direction form the Alberta border and Meadow Lake in the Northwest to Yorkton and the Manitoba border in the Southeast. This zone is, on average, three to four Rural Municipalities in depth. For purposes of this report, the area described above is designated the "Non-industrial Forest Zone" (NIFZ).

The NIFZ is covered by a number of different forms of land tenure. The major tenure form in the NIFZ is private (deeded) land. The private land area has, in the main, been developed for conventional agricultural purposes such as grain production and pastureland. However, a

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* See glossary for definitions

considerable area of private tenured land remains undeveloped. Much of the undeveloped land is covered with trees of commercial or potential commercial value.

There are other forms of land tenure within the NIFZ that contain substantial area of forest. Other land tenures that have been recognized as having forest cover are:

1. Saskatchewan Parks and Renewable Resources.
2. Indian Reserves.
3. Land Bank.
4. Community Pastures.
5. Crown Leases.
6. Wildlife Development Fund.
7. Canadian Wildlife Service.
8. Vacant Crown Land.

The areas within the NIFZ that have large concentrations of forest cover (primarily coniferous) have already been delineated and classified as Provincial Forest. These forests comprise part of the provincial forest inventory maintenance area and are administered by the Department of Parks and Renewable Resources for both recreational and commercial purposes.

Indian Reserves are administered by the Federal government. A number of Indian Reserves contain areas of large and concentrated forest land. These lands could also become an important source of industrial wood.

It is estimated that for every 1.0 hectares of forest located on private (deeded) land, there is 0.7 hectares located on other tenures within the NIFZ of the province. The 0.7 hectare estimate does not include forest land within Provincial Forest or Indian Reserve boundaries. The forest resource contained within other tenures in the NIFZ is substantial and has the potential to become a significant source for future industrial wood requirements.

However,m this report is primarily concerned with the forests in the NIFZ that are located on private (deeded) land. Forests located on private deeded land will be referred to throughout this report as "Non-industrial Private Forest" (NIPF). The foundation data used to prepare this report on NIPF potential in Saskatchewan was developed by the Manitoba Remote Sensing Centre (MRSC).

3.0 MANITOBA PROJECT

3.1 Remote Sensing

Forestry Canada entered into a contract with the Manitoba Remote Sensing Centre that would provide Landsat based cover mapping for 24 map sheets in central Saskatchewan. The area covered by these map sheets approximates the area that has been described as the Non-industrial Forest Zone (NIFZ). It was believed that an automated approach to mapping the fores resource in this broad area of Saskatchewan would yield significant benefits over conventional methods such as aerial photographs or manual field surveys. The savings would lie both in time and financial resource.

3.2 Approach

Computer tapes were ordered form the Prince Albert Satellite Receiving Station covering the area to be surveyed. The Station selected the most cloud free imagery. It was imperative to have spring data which would provide the best spectral separation for the woodland cover. The imagery was required to show flush in the deciduous cover but no germination in the cereal crops. Because of this stringent and narrow biological window, all tapes are not necessarily from the same year

3.3 Cover Type Classification

The classes, or themes, and the grouping of classes derived from remotely sensed data were defined by the Canadian Forestry Service in consultation with technical experts from the Manitoba Remote Sensing Centre (MRSC).

It was determined that the potential for class confusion increased as the division between classes was made finer. Class confusion results from one class bleeding into another.

The reliability of forest cover identification and classification is dependent upon the number of specific predetermined themes. The reliability of theme identification diminishes in direct proportion to the number of themes to be identifies. A larger number of themes required more theme boundaries and more strictly defined boundary limits, thus increasing the potential for identification error.

In order to reduce the potential for error in theme identification an initial two theme forest cover classification system was specified. The two them categories were:

1. Deciduous
2. Coniferous

3.4 Image Processing

Radiometrically corrected LANDSAT imagery was processed on DIPIX ARIES III image analysis equipment resident at the MRSC in Winnipeg.

Image classification involved the selection of pure "training" areas, representing each cover class of interest, from aerial photographs and ground reference data. Next, a "signature" file of the spectral attributes of that cover type was generated which is used to classifying the image. The image analysis system sorted pixels into respective cover types according to their spectral signatures. These signatures were generated from all four bands of LANDSAT.

3.5 Final Map Products

The MRSC supplied one set each of the following output products:

A. 1:125,000 scaled map showing the location of forest land broken down by the forest classification system with Rural Municipality boundaries digitized as an overlay.

B. 1:125,000 scaled map showing the location of forest land with the land tenure digitized as an overlay.

C, 1:500,000 scaled map showing the location of forest land broken down by the forest classification system with Rural Municipality boundaries digitized as an overlay.

4.0 INVENTORY

4.1 General

An inventory is a record of things in stock. A forest inventory collects information on the land characteristics, trees and other resource values in an area. It will help to determine what is physically possible and financially realistic in managing woodland property. Forest inventory is used to set management goals, develop Forest Management Plans and schedule on-the-ground forest operation.

Though the sane type of information is required for each of these purposes, the level of detail and precision of the information required is quite different. For example, to define goals for the Farm Woodlot Association requires a general sense of what is out there, whereas a farm woodlot owner required a detailed sense of what is out there.

The inventory data presented in this report outline or frames the potential for wood production from private lands in the NIFZ of the province. It does not, however, give the detailed information that is necessary for management planning, forestry operations or for the promotion of any industrial activity.

The broad based inventory framework that was developed by means of satellite imagery and is presented in this report, has permitted an estimate to be made of the forestry potential on private lands in the NIFZ of Saskatchewan. It has given a picture, at a particular point in time, of the location of timber stands that are ten hectares and greater in area. In addition, it has permitted the identification of timber stand concentrations outside designated provincial forest. This latter information provides a basis for prioritizing area for field investigation and possible intensive forest surveys.

The results of these surveys would indicate the true forest potential as to resource quantity and quality.

4.2 Area Determination

The Manitoba Remote Sensing Centre provided LANDSAT based land cover mapping for twenty-four (24) map sheets. The maps covered the Non-industrial forest zone as described earlier in the report. There were several fringe areas that were not covered by satellite image

In order to minimize cost, MRSC laid the mapping process out in a manner as to require the least number of satellite images and final map sheets. One Landsat image covers 185 kilometres in a north-south direction. Edge areas of a number of Rural Municipalities were missing slivers of satellite images. Therefore, some Rural Municipalities are not complete as to area and volume computation. However, the information gaps are quite small, and at this date, do not warrant the large increase in expenditures required to secure the data. At a later date, either using conventional aerial photographs or further satellite imagery, these small information gap areas can be filled.

Truthing stations were established in various locales of the province. These stations were identified through aerial photography and then ground surveyed to determine an accurate forest cover classification. A signature file was then developed, using the ground survey data collected at the "truthing" stations as bench marks. The signatures developed for timber stand classifications were programmed into the image analysis system. The signature file of the special attributes of a particular cover type, or theme, was generated and used to classify forest cover type images throughout the NIFZ. The image analysis system sorted pixels into respective forest cover types according to there spectral signatures.

Table One

Non-Industrial Private Forests - Area Summary

	Area in Hectares		
	Hardwood	Softwood	Total
Western Region	202,521	44,361	246,882
Central Region	240,413	28,908	269,321
Eastern Region	136,254	15,069	151,323
Saskatchewan	579,186	88,338	667,524

Maps showing the location of Rural Municipality boundaries and private land tenure were digitized as an overlay of the satellite imagery. The Multispectral scanner data, with its pixels resampled to 102 metres (4.04% larger than 1 hectare) provided adequate resolution for mapping woodland stands of ten hectares and greater. Ten hectares was represented by clusters of ten LANDSAT pixels.

A pixel count, by forest cover classification, by tenure and by Rural Municipality, was made for the NIFZ of Saskatchewan. The summation of pixel count information, by category, determined the forest cover base area.

4.3 Volume Determination

The volume per hectare values used to compute total wood volumes in the NIFZ were derived from work done by Newforest Resources Incorporated. A total of 404 sample locations were randomly chosen and then delineated as to forest cover type. Sample plots were located in 38 Rural Municipalities. The plot sites were ground located and sampled. All trees measuring greater than 7.0 cm at D.B.H. that fell within the B.A.F. 2 cubic metre per hectare prism sweep were recorded. Height and age class information was secured for all timber stands sampled. Height/diameter curves were developed from the plot data. Volume totals, average and standard errors were calculated by broad forest cover type.

Volume was calculated from the standard volume equation:

$V = b\ D^2\ H$

where:

b adjusts for taper and varies by species and diameter class.

H is taken from special height/diameter curves developed from the height measurements taken in the survey.

The diameter class volume was multiplied by a varying STF or stand table factor (which decreases with increasing diameter; from provincial tables) to obtain volume per hectare.

The total volumes per hectare were grouped for the two types - Deciduous and Coniferous.

The Deciduous and Coniferous totals were both combined and broken down into constituent species and species association sub totals, and averaged from the number of plots. This average is the cubic meter per hectare factor which is applicable to the area tabulations developed by the Manitoba Remote Sensing Centre..

To give a statistical measure of the validity of the volume factors, confidence tests were applied, using the following formulae:

S^2 **(variance)** $= [\sum X^2-(\sum X)^2/n]/(n-)$

Se (standard error) $= _\sqrt{S^2/n}$

ç (confidence statement) $= u \pm t.Se$

The confidence statement was calculated to the 95% level (i.e., a likelihood of finding a new sample in that range 19 times out of 20) and to the 98% level for Coniferous and Deciduous and all forest cover types.

The **per hectare** volumes to be applied to the theme areas as determined from the Multispectral scanner data are:

ALL FOREST COVER TYPES = 106.3 ± 6.6 Cubic Meters

DECIDUOUS = 102.5 ± 7.1 Cubic Meters

CONIFEROUS = 119.1 ± 15 4 Cubic Meters

The resulting volumes are as follows:

Table Two

Non-Industrial Private Forests - Volume Summary

	Volume in '000 cubic metres.		
	Hardwood	Softwood	Total
Western Region	20,758.4	5,283.4	26,041.8
Central Region	24,642.3	3,442.9	28,085.2
Eastern Region	13,996.1	1,794.7	15,790.8
Saskatchewan	59,366.8	10,520.9	69,887.7

4.4 Harvesting Volume Schedules

A Harvest Volume Schedule is an estimate of the sustained volume of wood that can flow from a forested area. It is sometimes referred to as "annual allowable cut".

The Harvest Volume Schedule is primarily dependent upon the number of years required for trees to grow to maturity. The period of time for a tree to grow to maturity is called the "rotation age"/ A rotation age of ninety (90) years is used for coniferous forest cover types and seventy (70) years for deciduous cover types in an unmanaged forest in Saskatchewan.

The Harvesting Volume Schedule is also dependent upon the definition of timber supply or "growing stock". Some definitions of timber supply or growing stock are as follows:

1. Biological wood supply, represented by the volume of wood fibre existing at any point in time and the potential for fibre growth based on fores land productivity. This could also be defined as growing stock volume.
2. Merchantable timber supply, represented by the volume of standing timber that is suitable for a particular roundwood product. This supply depends on industrial wood requirements, wood processing technologies, and developments in roundwood product markets.
3. Economic timber supply, represented by the portion of the merchantable supply that can be profitably procured, harvested, delivered, and processed, i.e., the volume of timber where the costs of processing are less than or equal to the product's value.
4. Long-term timber supply, represented by that volume of timber that is economically available on an annual basis, that assures some level of future harvest.

The wood volume estimates generated for this report are defined as the biological wood supply existing in the year 1988.

Table 3 summarizes the Estimated Harvest Volume Schedules for the NIFZ of the province and each of the three delineated regions. The volume schedules were calculated using rotation ages of 70 and 90 years respectively for Deciduous and Coniferous fores cover classifications.

Table Three

Harvest Volume Schedules

	Volume in Cubic Metres		
	Hardwood	Softwood	Total
Western Region	296,549	58,543	355,092
Central Region	352,033	38,254	390,287
Eastern Region	199,515	19,941	219,456
Saskatchewan	848,097	116,738	964,835

4.5 Field Verification

Random field investigations were carried out in order to assess the accuracy of timber stand map locations and to verify the reliability of themes (cover classification) and timber volume estimates.

Field investigation trips to the Rural Municipalities of Canwood, Shellbrook, St. Louis, Prince Albert, Garden River, Paddockwood, Lakeland, Duck Lake Birch Hills and Hudson Bay were made. Visual inspection of the areas confirmed the reliability of geographic location and the general reliability of theme signatures. No timber cruises were conducted to objectively assess the percentage composition of timber stands by coniferous and deciduous volumes.

The volume estimates made for timber stands on a per hectare basis fell within the predetermined expected range.

It was, however, evident that forest stands located in the northern range of the NIFZ were of superior quality to those in the southern reaches of the zone. In general, the size and quality of trees tended to decrease the further south travelled. However, pockets of exceptionally high volume and quality timber stands were found to exist in the southern limits of the NIFZ.

5.0 STUDY SUMMARY

The province was divided into three major regions: Western, Central and Eastern, and each region was, in turn, divided into two divisions. Boundaries for regions were chosen on the basis of haul distance to existing or major potential forest industrial centres. Division boundaries were determined on potential total value of timber harvest. Division 1 in each region contains a more concentrated volume of wood and (the Central Region excepted) is generally closer to existing major industrial sites. Division 2 contains substantial volumes of wood but would tend to be the more marginal supply area for incremental industrial wood demand.

5.1 Total NIFZ

In the NIFZ there are 667,524 hectares of private forest land, which contains an estimated wood volume of 69,887,700 cubic metres. The Estimated Harvesting Volume Schedule (the volume of harvest that can be sustained) calculated for the NIFZ, using a Deciduous rotation age of 70 years and a Coniferous rotation age of 90 years, is 964,835 cubic metres. 848,097 cubic metres or 87.9 percent of the estimated volume harvest would originate from Deciduous forest cover types and 116,738 cubic metres or 12.1 percent would originate from timber stands classified as Coniferous.

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Eastern Region	199,515	19,941	219,456
Saskatchewan	848,097	116,738	964,835

5.2 Western Region

The western Region has 246,880 hectares of private forest land. It is estimated that these NIPFs contain a wood volume of 26,041,700 cubic meters and could sustain an annual harvest of 355,092 cubic meters.

5.3 Central Region

The Central Region has 269,321 hectares of private forest land. It is estimated that these NIPFs contain a wood volume of 28,085,200 cubic meters and could sustain an annual harvest of 390,287 cubic meters.

Table Four

Non-Industrial Private Forests - Saskatchewan

Area, Volume and Harvest Volume Schedule Summaries

	Area (hectares)		Volume (1,000 M^3)		Harvest Volume Schedule (M^3)	
	HWD	SWD	HWD	SWD	HWD	SWD
WESTERN REGION						
Division One	79,467	39,668	8,145.4	4,724.5	116,363	52,333
Division Two	123,054	4,693	12,613.0	558.9	180,186	6,210
Totals	202,521	44,361	20,758.4	5,283.4	296,549	58,543
CENTRAL REGION						
Division One	145,842	18,592	14,948.8	2,214.3	213,554	24,603
Division Two	94,571	10,316	9,693.5	1,228.6	138,479	13,651
Totals	269,321	28,908	24,642.3	3,442.9	352,033	38,254
EASTERN REGION						
Division One	61,152	12,167	6,268.1	1,449.1	89,544	16,101
Division Two	75,102	2,902	7,698.0	345.6	109,971	3,840
Totals	136,254	15,069	13,996.1	1,794.7	199,515	19,941
PROVINCIAL SUMMARY	608,096	88,338	59,396.8	10,521.0	848,097	116,768

TOTAL AREA 696,434 hectares

TOTAL VOLUME 69,917,800 cubic meters

TOTAL HARVEST VOLUME SCHEDULE 964,835 cubic meters

HWD - hardwood (deciduous) SWD (coniferous)

M^3 - Cubic Meters

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5.4 Eastern Region

The Eastern Region has 151,323 hectares of private forest land. It is estimated that these NIPFs contain a wood volume of 15,418,102 cubic meters and could sustain an annual harvest of 219,456 cubic meters.

6.0 RECOMMENDATIONS

The process of determining wood volumes for NIPF land in Saskatchewan is a relatively new process and much pertinent support data is simply not available. However, a framework was developed, using satellite imagery for area determination and broad based wood volume averages, that has permitted an estimate of the biological wood supply (growing stock volume) to be made. There is much room for refinement.

Given the potential for the NIFZ to become an important industrial wood supply source in the province, an effort to improve our knowledge of the area and its forest resource should be made.

Many of the recommendations that follow are directed toward the purpose of increasing our knowledge of the NIFZ forest resource. The outlined recommendations do not have to be implemented on a large scale but could be built upon incrementally and the cost of data collection and resource inventory refinement spread over many years.

It is recommended that:

1) The estimated remaining 500,000 hectares of forested land in the NIFZ located on tenures, other than that managed by the Department of Parks and Renewable Resources, under provincial jurisdiction be surveyed using satellite imagery. Area and wood volume estimates should be segregated by land tenure, Rural Municipality and theme.

2) The Farm Woodlot Association be made aware of any planned inventory surveys in the NIFZ by government agencies. Where possible and practical, the F.W.A. should become an active participant in the planning and implementation of NIFZ inventory programs

3) Detailed inventory surveys be conducted in the NIFZ in chosen areas in order to determine both wood quantity and quality. The following broad criteria should be used in prioritizing areas for comprehensive timber cruising.

a) close to existing industry
b) close to planned industrial development
c) high productivity land
d) farmer and community interest

7.0 CONCLUSIONS

Estimating the colume of wood fibre that could be supplied from NIPF land in the NIFZ of the province using satellite imager is a complicated issue.

It has been concluded, based upon field verification trips, that fores cover area determination is quite reliable. However, there is no way to determine at this time the accuracy of the colume per hectare values that were applied to the forest area.

It is believed that the biological timber supply (growing stock; 7.0 cm. dbh and larger) estimated made for each region and the NIFZ in total will ultimately prove to be reasonably accurate. However, the potential error size will increase as the size of the area for which volume estimates are made decreases. The volume estimated for the total non-industrial forest zone has the highest probability of having the smallest error. Regional volume estimates will have the next highest order of confidence, followed in descending order by volume estimates for Divisions, Rural Municipalities, Townships, Sections, quarter sections and lastly, the individual timber stand.

It is subjectively concluded, based upon observations made on field verification trips, that the timber volume estimates for the Rural Municipalities located in the southern range of the NIFZ are overestimated, whereas the volume estimates for the northern Rural Municipalities appear to be low.

The NIPF land base identified through satellite imagery is not all suited for commercial timber production. Much of the land should be primarily managed for other purposes such as wildlife

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APPENDICES

Non-Industrial Private Forests - Saskatchewan

WESTERN REGION R.M. SUMMARIES

Area and Volume

	AREA (hectares)		VOLUME (1000 cubic meters)	
	HWD	SWD	HWD	SWD
DIVISION ONE				
RM 561 - LOON LAKE	15,170	1,052	1,554.9	125.3
RM 588 - MEADOW LAKE	57,224	37,603	5,865.5	4,478.5
RM 622 - BEAVER RIVER	7,073	1,013	725.0	120.6
TOTALS	79,467	39,668	8,145.4	4,724.4
DIVISION TWO				
RM 437 - North Battleford	2,887	60	295.9	7.1
RM 438 - Battle River	9,548	76	978.7	9.1
RM 467 - Rounds Hill	7,771	150	796.5	17.9
RM 468 - Meota	6,305	187	646.3	22.3
RM 469 - Turtle River	5,892	75	603.9	8.9
RM 471 - Eldon	7,728	62	792.1	7.4
RM 497 - Medstead	11,805	1,372	1,210.0	163.4
RM 498 - Parkdale	15,591	593	1,598.1	70.6
RM 499 - Mervin	8,415	330	862.5	39.3
RM 501 - Frenchman Butte	30,627	867	3,139.3	103.3
RM 502 _ Britannia	5,798	26	594.3	3.1
RM 529 - Greenfield	10,687	895	1,095.1	106.6
Totals	123,054	4,693	12,613.0	558.9

Non-Industrial Private Forests - Saskatchewan

CENTRAL REGION R.M. SUMMARIES

Area and Volume

	AREA (hectares)		VOLUME (1000 cubic meters)	
	HWD	SWD	HWD	SWD
DIVISION ONE				
RM 434 - Blaine Lake	5,623	298	576.4	35.5
RM 435 - Redberry	15,623	436	1,601.4	51.9
RM 436 - Douglas	1,509	301	154.7	23.9
RM 464 - Leask	21,986	2,143	2,253.6	255.2
RM 466 - Meeting Lake	14,204	1,194	1,455.9	142.2
RM 494 - Canwood	43,055	7,636	4,413.1	909.4
RM 496 - Spiritwood	32,307	5,200	3,311.5	619.3
RM 555 - Big River	11,535	1,484	1,185.3	176.7
TOTALS	145,842	18,592	14,948.8	2,214.3
DIVISION TWO				
RM 429 - Flett's Springs	4,765	647	488.4	77.1
RM 430 - Invergordon	9,009	325	923.4	38.7
RM 431 - St. Louis	2,703	55	227.1	6.6
RM 459 - Kinistino	5,892	75	603.9	8.9
RM 460 - Birch Hills	2,604	98	266.9	11.7
RM 461 - Prince Albert	10,604	474	1,086.9	56.5
RM 463 - Duck Lake	16,112	1,124	1,651.5	133.9
RM 490 - Garden River	3,375	629	382.8	74.9
RM 491 - Buckland	6,696	2,085	686.3	248.3
RM -493 - Shellbrook	16,059	3,277	1,646.0	390.3
RM 520 - Paddockwood	6,390	725	655.0	86.3
RM 521 - Lakeland	10,002	802	1,025.2	95.5
TOTALS	94,571	10,316	6,693.5	1,288.6

Non-Industrial Private Forests - Saskatchewan

EASTERN REGION R.M. SUMMARIES

Area and Volume

	AREA (hectare)		VOLUME (1000 cubic meters)	
	HWD	SWD	HWD	SWD
DIVISION ONE				
RM 394 - Hudson Bay	8,297	973	850.4	115.9
RM 395 - Porcupine Plain	9,545	834	978.4	99.3
RM 397 - Barrier Valley	7,334	1,352	751.7	161.0
RM 398 - Pleastandale	3,235	190	331.6	22.6
RM 427 - Tisdale	3,791	353	388.6	42.0
RM 428 - Star City	2,799	173	286.9	20.6
RM 456 - Arborfield	3,277	90	335.9	10.7
RM 457 - Connaught	3,707	10	380.0	1.2
RM 458 - Willow Creek	850	275	87.1	32.58
RM 486 - Moose Range	4,695	804	481.2	9538
RM 487 - Nipawin	2,461	1,064	252.3	192.2
RM 488 - Torch River	3,644	2,607	373.5	310.5
Totals	61,152	12,167	6,26831	1,449.1
DIVISION TWO				
RM 271 - Kamsack	6,059	27	621.0	3.2
RM 273 - Donwell	2,116	15	216.9	1.8
RM 274 - Burgis	3,940	15	403.9	1.8
RM 275 - Insinger	4,628	16	474.4	1.9
RM 276 - Foam Lake	4,306	0	441.4	0
RM 301 - Pelly	4,709	77	482.7	9.2
RM 303 - Canora	6,110	443	626.3	52.8
RM 304 - Buchanan	1,869	103	191.6	12.3
RM 305 - Invermay	2,576	13	264.0	1.5
RM 331 - Livingstone	6,177	334	633.1	39.8
RM 333 - Clayton	6,033	216	618.4	25.7
RM 334 - Preeceville	7,160	690	733.9	82.2
RM 335 - Hazel Dell	6,648	162	681.4	19.3
RM 335 - Sasman	1,370	0	140.4	0
RM 337 - Lakeview	221	0	22.7	0
RM 366 - Kelvington	10,587	686	1,085.2	81.7
RM 367 - Ponass	593	105	60.8	12.5
TOTALS	75,102	2,902	7,698.0	345.6

APPENDIX TWO - CONVERSION FACTORS

One cord is: 1) 128 cubic feet of wood (stacked)

2) 85 cubic feet of SOLID wood

3) a pile of logs 4' x 4' x 8'

One Board Foot is a piece of wood 1" x 12" x 12"

One Cunit is 100 cubic feet of wood

To determine the GROSS VOLUME of a log

$$\text{Vol.} = \frac{0.7854 \left(D + d \right)^2}{10{,}000} \times \text{length in metres}$$

= volume in cubic metres

Where D is large end diameter and d is small end diameter in centimetres.

CONVERSION FACTORS

1 inch	= 2.54 centimetres	1 centimetre	= 0.393 inches
1 chain	= 20.116 metres	1 metre	= 3.28 feet
1 mile	= 1.609 kilometres	1 kilometre	= 0.621 miles
1 acre	= 0.404 hectares	1 hectare	= 2.471 acres

1 cord (128 ft.) = 3.624 cubic metres
1 cunnit (100 ft.) = 2.831 metres

1 cubic metre = 0.275 cords
1 cubic metre = 0.353 cunnits

APPENDIX D

FINANCIAL MODEL INPUTS: REVENUES AND COSTS

Grain Farm Inputs

Most of the grain farm inputs are included on a per acre basis, which allows the size of the farm operation to vary, within reasonable ranges, without changing the input. The grain farm inputs have been obtained from the **Farm Business Management Data Manual**, published by Saskatchewan Agriculture and Food, Economics Branch. We have chosen cost and yield data for the black soil zone in Saskatchewan to represent our model grain farm, although the model is designed to accept any input.

The detailed grain farm inputs are as follows:

- Capital Cost Allowance (C.C.A.) rates are expected to be 10% for buildings, 20% for machinery and 30% for trucks.

- The forecasted grain yields are based on the black soil zone averages which are:

Crop	Yield in Bushels Per Acre
Wheat	33
Barley	55
Canola	29

- Grain prices are set for year one based on G.R.I.P. (Guaranteed Revenue Insurance Program). Year one prices are:

Crop	Price in $ Per Bushel
Wheat	4.15
Barley	2.17
Canola	6.56

- The cost of sales data used is based on averages for the black soil zone in Saskatchewan. The estimates are as follows:

Expense Category	Wheat	Barley	Canola
Seed ($/bushel)	4.15	2.17	6.56
Fertilizer ($/tonne)	315.00	315.00	315.00
Herbicide ($/gallon)	10.00	10.00	10.00
Insecticide ($/gallon)	10.00	10.00	10.00
Crop Insurance ($/acre)	3.15	1.88	3.66
G.R.I.P. Premium (% of gross)	7.4%	7.3%	4.9%
Fuel and Oil ($/acre)	5.86	6.46	6.26
Repairs ($/acre)	4.76	6.31	5.67
Miscellaneous ($/acre)	2.45	3.78	5.72
Usage	**Wheat**	**Barley**	**Canola**
Seed (Bu/acre)	1.40	1.40	1.10
Fertilizer (tonnes/acre)	.04	.04	.03
Herbicide (Gallons/acre)	.70	.70	1.27

~~Insecticide (Gallons/acre)~~	.03	.03	.09

The cost per gallon is as follows:

Expense Category	$/Acre
Herbicide	2.04
Fuel and Oil	3.52
Repairs	3.01
Miscellaneous	.79

- Fixed operating expenses are estimated, which are dependent upon the size of the operation. Estimates are made for the following:
    - Property taxes
    - Power and telephone
    - Insurance
    - Overhead
    - Accounting and legal
- All opening balance sheet data is inputed, included working capital, long-term assets, debt financing and opening net worth.

Woodlot Inputs

Data on woodlot inputs is less readily available than grain farm inputs. As was indicated earlier, we have relied on past studies on the woodlot industry as well as interviews with current woodlot operators to acquire the appropriate inputs for the woodlot model. The inputs required can be categorized as follows:

- Quantity of Woodlot Sales

In the situation where an owner is clearcutting, an estimate must be made of the harvest rate per year. In the Quebec study, woodlot operators were harvesting an average of 8% of their woodlot annually. Woodlot owners in Quebec are involved mostly in softwood pulp harvesting (95%). In the Fautley study for Saskatchewan, a harvest rate of 2.7% was used for white poplar woodlots. Given an average stand of 112 m^3/ha, this translated into a yield of approximately 3 m^3/ha/year (1.2 m^3/acre). In the Johnston paper, he indicates a 15 year cycle, which implies a 6.7% harvest rate. The Coxworth paper reports that shelterbelts should yield about 0.5 m^3/ac/year of wood. Hector Shiell from Medstead, Saskatchewan, has indicated that he harvests 50 cords from 4 - 5 acres/year from a total of 75 acres of mainly poplar. This translates to a harvest rate of about 5_ - 6_% per year or 2.4 m^3/acre. Dave Halland from Love, Saskatchewan has indicated an annual harvest of approximately 140,000 boardfeet/year (approximately 326 m^3) off 30 to 40 acres from a 1,000 acre woodlot. Henry Alaers, from Spiritwood, Saskatchewan, expects a projected firewood harvest of 5 - 10 acres/year from a 120 acre woodlot, indicating a harvest rate of approximately 4% - 8% per year. These findings imply that harvest rates and yields are quite variable throughout the province.

Table D-1 displays the harvest rates and yields collected.

Table D-1. Harvest Rates and Yields

Source	Product	Harvest Rate	Yield (m^3/acre)
Quebec Study	Pulpwood	8.0%	1.74
Ray Fautley	Aspen Poplar	2.7%	1.22
Jim Johnston	Saw Timber	6.7%	--
E. Coxworth	White Spruce	--	1.76
	Jack Pine	--	1.11
	Aspen Poplar	--	1.77
	Green Ash	--	1.34
	Siberian Larch	--	2.00
Hector Shiell	Poplar Firewood	5.5 - 6.5%	2.40
Dave Halland	Spruce and Pine Products	2.9 - 4.0%	5.85
Henry Alaers	Firewood	4.0 - 8.0%	2.40
	Christmas trees	12.5 - 16.7%	

Note: The lower the harvest rate the older the tree at harvesting.
-- Not Available

Wood Product Prices

The second important element of the total revenue estimate is expected selling price for each product. The most recent price being offered for delivered pulpwood by Weyerhauser in Prince Albert has been reported to be \$17/m^3 on average, with a range of \$16 to \$18/m^3.

Firewood prices for poplar have been reported at a \$55/cord (\$15.17/m^3) at the woodlot site, which implies no transportation cost to the seller. Other reported firewood prices for birch have been as high as \$130/cord (\$35.86/m^3) delivered to firewood wholesalers, or \$200/cord (\$55.17/m^3) selling directly to the consumer, usually at a city location.

Jim Johnston quotes some prices in his paper, such as saw timber which sold of \$37.50 a thousand on the stump (\$23.10/m^3), poplar which sold for \$2.00/cord stumpage (\$.55/m^3) to be used for pulp and poplar building logs which sold for \$60/cord) (\$16.55/m^3). As well, Johnston suggests prices for posts and rails at \$26.46/m^3, Larch sawlogs at \$43.44/m^3, Ash sawlogs at \$105.93/m^3 and Aspen pulpwood at \$16.62/m^3.

L. Harding also has studied prices for various products. He reports prices for posts and rails at \$22/m^3, spruce/pine sawlogs at \$22.40/m^3, aspen sawlogs at \$19/m^3, spruce/pine veneer at \$35/m^3, aspen veneer at \$23/m^3, and birch veneer at \$124.64/m^3.

Dave Halland has quoted several prices for his products, which usually include some value added. He indicated that pine products sell at \$450/1000 board feet (\$277/m^3), birch products sell at \$1000/1000 board feet (\$616/m^3) and spruce products sell at \$350/1000 board feet (\$216/m^3). These would represent average prices for value added products such as birch and pine flooring, tongue and groove,

channel board, log siding, levelled siding, shakes, building logs, and log home buildings.

Table D-2 presents a summary of reported selling prices for the current year. Prices reported by Shiell, Halland and Alaers are those received at the farm gate, while all others are delivered to a mill.

Table D-2. Product Selling Price 1991

Source	Product	Selling Price ($per m^3)
Weyerhauser	Pulpwood	$17.00
H. Shiell	Firewood	15.00
J. Johnston	Posts and Rails	26.46
	Larch Sawlogs	43.44
	Ash Sawlogs	105.93
	Aspen Pulpwood	16.62
L. Harding	Posts and Rails	22.00
	Spruce/Pine Sawlogs	22.40
	Aspen Sawlogs	19.00
	Spruce/Pine Veneer	35.00
	Aspen Veneer	23.00
	Birch Veneer	124.64
D. Halland	Pine Products	277.00
	Birch Products	616.00
	Spruce Products	216.00
H. Alaers	Poplar Firewood	16.00
Saskatoon	Birch Firewood (wholesale)	35.86
	Birch Firewood (retail)	55.17

Direct Logging Costs

Direct logging costs include the following:

- Stumpage Fees
- Felling and Bucking
- Yarding and Studding
- Loading
- Hauling
- Scaling
- Slash Disposal
- Roads and Maintenance
- Hired Labour

The financial model requires that each of these costs be inputted as a cost per cubic metre harvested. To acquire the appropriate costs we have used several sources: the Quebec study, the Fautley paper and interviews with Saskatchewan woodlot operators. The resulting costs are presented in Table D-3.

Table D-3. Direct Costs per Cubic Metre (Not Including Owner Wages)

Cost Category	Quebec Study	Ray Fautley	Woodlot Operators
Stumpage fee	--	--	1.38
Hired labour	$1.93	--	--
Fuel and oil	1.42	--	--
Maintenance and repair	2.06	--	--
Rental equipment	.33	--	--
Contract work	.63	--	--
Material and tools	.38	--	--
Cutting, forwarding, bucking		1.64	--
Loading	-	1.65	1.21
Hauling (100 kms)	--	10.23	5.15 - 9.65/100 km
Miscellaneous	--	1.25	--

-- Not Reported

Indirect Costs

Indirect logging costs include the following:

- Lease Payment
- Property Taxes
- Office Expenses
- Insurance
- Legal and Accounting
- Travel
- Marketing

For our financial analyses, these costs will be estimated as an incremental basis for each case. For estimates, we have relied mainly on the studies cited and woodlot operator interviews.

Costs of Forest Management

Cost of forest management include:

- Engineering
- Cruising and Inventory
- Mapping
- Planning
- Protection
- Site Supervision

Our interviews with woodlot owners have indicated that very little if any expenditures is incurred for forest management. It appears that forest management does require some of the operators time and labour rather than actual cash output. Our analyses will include an allowance for operator time and labour in each case.

Costs of Silviculture

These costs include:

- Site Preparation
- Planting
- Surveys
- Spacing
- Rehabilitation
- Seed Extraction
- Seedlings
- Weeding

Our interviews have determined that little expenditure is incurred other than seedlings (15¢ - 25¢/tree). The remainder of the cost is in terms of operator time and labour.

Capital Costs

For a grain farmer, the incremental capital costs to operate a relatively small woodlot are expected to be minimal. Assuming the farmer already owns a truck, tractor with front-end loader, chains, tools, etc., the incremental costs would be for a chainsaw(s), winch and some smaller miscellaneous items. The main costs to a farmer in this case are the variable costs (direct costs) and the opportunity cost of the farmer's time and labour. In this case, capital costs will be estimated based on the results of woodlot operator interviews.

In the case of a woodlot operator who is now a grain farmer, additional capital costs will have to be incurred. Depending on the size of the woodlot, capital expenditure could apply to the following equipment:

Tractor	Snow blower
Forwarder	Welder, compressor
Skidder	Trailer and loader
Feller-buncher	Winch, chains, harness
ATV, snowmobile, dozer	Chain saws
Truck	Workshop
Saw mill, splitter	Drying kiln

Estimates of new equipment have been obtained from suppliers. Our interviews have determined that used equipment can also be purchased, usually at much lower cost than new. In the case of a woodlot operator who is not a grain farmer, capital cost estimates will be made for a suggested list of equipment and other capital assets.

APPENDIX E

FINANCIAL MODEL PRINTOUT

FARM-WOODLOT PLAN

FARM INPUT SECTION

STEP ONE: Input the expected inflation rate, operating loan rate, and the expected T-Bill rate for each year

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Expected Inflation Rate	INPUT	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Operating Loan Rate	INPUT	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
T-Bill Rate	INPUT	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Present Value Discount Rate	INPUT	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14

STEP TWO: Input the beginning land inventory plus any purchases or sales expected during the next 5 years

Land Purchase and Sale																
Beginning Land Inventory	INPUT	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000
Purchases	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Land Inventory		275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000

Input opening balances for the following

Cash	INPUT	4,000	Check	
Accounts Receivable	INPUT	0	Assets	453,500
Inventory	INPUT	10,500	Liab and O E	453,500
Other Current Assets	INPUT	0		
Machinery	INPUT	140,000		
Trucks	INPUT	20,000		
Machinery and Equipment		160,000		
Less: Accumulated Depreciation	INPUT	50,000		
Breeding Stock	INPUT	0		
Building & Improvements	INPUT	75,000		
Less: Accumulated Depreciation	INPUT	25,000		
Land		275,000		
Accounts and Rent Payable	INPUT	23,500		
Dividends Payable	INPUT	0		
Income Taxes Payable	INPUT	0		
Intermediate Debt	INPUT	50,000		
Long Term Debt	INPUT	60,000		
Net Worth	INPUT	300,000		

STEP THREE: Input the beginning amount for buildings(class 6), machinery(class 8), and trucks(class10)
Input the CCA rate for each class
Input the net of expected purchases and sales for each year

CCA Schedule	Rate															
Class 6 Buildings	0.10 INPUT															
Opening Balance		50,000	45,000	40,500	36,450	32,805	29,525	26,572	23,915	21,523	19,371	17,434	15,691	14,121	12,709	11,438
Net Additions(subtractions)	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
End Balance before CCA		50,000	45,000	40,500	36,450	32,805	29,525	26,572	23,915	21,523	19,371	17,434	15,691	14,121	12,709	11,438
CCA		5,000	4,500	4,050	3,645	3,281	2,952	2,657	2,391	2,152	1,937	1,743	1,569	1,412	1,271	1,144
Closing Balance		45,000	40,500	36,450	32,805	29,525	26,572	23,915	21,523	19,371	17,434	15,691	14,121	12,709	11,438	10,295
Class 8 Machinery	Rate															
Opening Balance	0.20 INPUT	80,000	72,000	57,600	46,080	36,864	29,491	23,593	18,874	15,099	12,080	9,664	7,731	6,185	4,948	3,958
Net Additions(subtractions)	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
End Balance before CCA		80,000	72,000	57,600	46,080	36,864	29,491	23,593	18,874	15,099	12,080	9,664	7,731	6,185	4,948	3,958
CCA		8,000	14,400	11,520	9,216	7,373	5,898	4,719	3,775	3,020	2,416	1,933	1,546	1,237	990	792
Closing Balance		72,000	57,600	46,080	36,864	29,491	23,593	18,874	15,099	12,080	9,664	7,731	6,185	4,948	3,958	3,167
Class 10 Trucks	Rate															
Opening Balance	0.30 INPUT	20,000	14,000	9,800	6,860	4,802	3,361	2,353	1,647	1,153	807	565	395	277	194	136
Net Additions(subtractions)	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
End Balance before CCA		20,000	14,000	9,800	6,860	4,802	3,361	2,353	1,647	1,153	807	565	395	277	194	136
CCA		6,000	4,200	2,940	2,058	1,441	1,008	706	494	346	242	169	118	83	58	41
Closing Balance		14,000	9,800	6,860	4,802	3,361	2,353	1,647	1,153	807	565	395	277	194	136	95

TAEM

STEP FOUR: Input the expected crop production and rotation for each of the next 5 years
Note: The total acres planned should correspond to the land inventory above but any difference will not impede calculation. All revenues will be based on projected total sales below

Year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CROP PRODUCTION																	
Acres Forecasted	750																
Wheat		INPUT	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Wheat (Durum)		INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Malt		INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Reg		INPUT	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Lentils		INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canola		INPUT	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Mustard		INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Seeded Acres			560	560	560	560	560	560	560	560	560	560	560	560	560	560	560
Fallow		INPUT	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
Total Acres			750	750	750	750	750	750	750	750	750	750	750	750	750	750	750

STEP FIVE: Input the expected yields, based on the above forecasted crop production

Year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Yields Forecasted (Bushel per Acre)																	
Wheat		INPUT	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Wheat (Durum)		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barley Malt		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barley Reg		INPUT	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
Lentils		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canola		INPUT	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Mustard		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STEP SIX: Input the expected prices for each crop

Year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Prices Forecasted (Price per Bushel)																	
Wheat		INPUT	4.18	4.34	4.53	4.74	4.95	5.17	5.40	5.65	5.90	6.17	6.44	6.73	7.04	7.35	7.68
Wheat (Durum)		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barley Malt		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barley Reg		INPUT	2.17	2.27	2.37	2.48	2.59	2.70	2.83	2.95	3.08	3.22	3.37	3.52	3.68	3.85	4.02
Lentils		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canola		INPUT	6.56	6.86	7.16	7.48	7.82	8.17	8.54	8.93	9.33	9.75	10.19	10.65	11.12	11.63	12.15
Mustard		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STEP SEVEN: Input the costs for each crop for the first year. The program will calculate the total cost for each crop, based on seeded acres. These costs are expected to increase each year at the expected rate of inflation.
Note: On the actual yearly expense statements below, the costs can be adjusted in any year

Year			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
COST OF SALES																	
Wheat																	
Purchased Seed																	
Cost/Bushel		INPUT	54.15	4.34	4.53	4.74	4.95	5.17	5.40	5.65	5.90	6.17	6.44	6.73	7.04	7.35	7.68
Bushels Seeded/Acre		INPUT	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Fertilizers																	
Cost/Tonne		INPUT	3315.00	329.18	343.89	358.47	375.84	392.55	410.21	428.67	447.96	468.12	489.19	511.20	534.20	558.24	583.36
Tonnes/Acre		INPUT	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Herbicides( )																	
Cost/Gallon		INPUT	110.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre		INPUT	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Herbicides( )																	
Cost/Gallon		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																	
Cost/Gallon		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre		INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )																	
Cost/Gallon		INPUT	110.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre		INPUT	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Equipment Rental		INPUT	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																	
Cost/Acre Harvest		INPUT	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre Spray		INPUT	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)		INPUT	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre		INPUT	33.15	3.29	3.44	3.58	3.76	3.93	4.10	4.29	4.48	4.68	4.89	5.11	5.34	5.58	5.83
Hail Insurance/Acre		INPUT	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent or Crop Share		INPUT	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Fuel and Oil																	
Cost/Seeded Acre		INPUT	35.66	6.13	6.40	6.69	6.99	7.30	7.63	7.97	8.33	8.71	9.10	9.51	9.94	10.39	10.85
Repairs																	
Cost/Seeded Acre		INPUT	34.76	4.97	5.20	5.43	5.68	5.93	6.20	6.48	6.77	7.07	7.39	7.72	8.07	8.44	8.82
Storage, Drying, Cleaning																	

Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	52.45	2.56	2.68	2.80	2.92	3.05	3.19	3.33	3.48	3.64	3.80	3.98	4.15	4.34	4.54
Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Wheat (Durum)																
Purchased Seed																
Cost/bushel	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bushels Seeded/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizers																
Cost/Tonne	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonnes/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticide ( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Rental	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																
Cost/Acre-Harvest	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom(s)	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hail Insurance/Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage, Drying, Cleaning																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barley Malt																
Purchased Seed																
Cost/bushel	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bushels Seeded/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizers																
Cost/Tonne	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonnes/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticide ( )																
Cost/Gallon	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Rental	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																
Cost/Acre-Harvest	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom(s)	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hail Insurance/Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage, Drying, Cleaning																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TAEM

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barley Reg																
Purchased Seed																
Cost/bushel	INPUT	$2.17	2.27	2.37	2.48	2.59	2.70	2.83	2.95	3.09	3.22	3.37	3.52	3.68	3.85	4.02
Bushels Seeded/Acre	INPUT	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Fertilizers																
Cost/Tonne	INPUT	$315.00	328.18	343.00	359.47	375.64	392.55	410.21	428.67	447.96	468.12	489.19	511.20	534.20	558.24	583.36
Tonnes/Acre	INPUT	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Herbicides( )																
Cost/Gallon	INPUT	$10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	INPUT	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )																
Cost/Gallon	INPUT	$10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	INPUT	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Equipment Rental	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																
Cost/Acre-Harvest	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre	INPUT	$1.86	1.96	2.05	2.15	2.24	2.34	2.45	2.56	2.67	2.78	2.92	3.05	3.19	3.33	3.48
Hail Insurance/Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil																
Cost/Seeded Acre	INPUT	$6.46	6.76	7.05	7.37	7.70	8.05	8.41	8.78	9.19	9.60	10.03	10.48	10.96	11.45	11.96
Repairs																
Cost/Seeded Acre	INPUT	$6.31	6.59	6.89	7.20	7.52	7.86	8.22	8.59	8.97	9.38	9.80	10.24	10.70	11.18	11.69
Storage, Drying, Cleaning																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	$3.78	3.95	4.13	4.31	4.51	4.71	4.92	5.14	5.38	5.62	5.87	6.13	6.41	6.70	7.00

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Lentils																
Purchased Seed																
Cost/bushel	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bushels Seeded/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizers																
Cost/Tonne	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonnes/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Rental	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																
Cost/Acre-Harvest	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hail Insurance/Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage, Drying, Cleaning																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TAEM

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Canola																
Purchased Seed																
Cost/bushel	INPUT	$6.56	6.86	7.16	7.49	7.82	8.17	8.54	8.93	9.33	9.75	10.19	10.65	11.12	11.63	12.15
Bushels Seeded/Acre	INPUT	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Fertilizers																
Cost/Tonne	INPUT	$315.00	329.18	343.99	359.47	375.64	392.55	410.21	428.67	447.96	468.12	489.19	511.20	534.20	558.24	583.36
Tonnes/Acre	INPUT	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Herbicides( )																
Cost/Gallon	INPUT	$10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	INPUT	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )																
Cost/Gallon	INPUT	$10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	INPUT	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Equipment Rental	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																
Cost/Acre-Harvest	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre	INPUT	$3.66	3.82	4.00	4.18	4.38	4.58	4.77	4.96	5.20	5.44	5.68	5.94	6.21	6.49	6.78
Hail Insurance/Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil																
Cost/Seeded Acre	INPUT	$6.26	6.54	6.84	7.14	7.47	7.80	8.15	8.52	8.90	9.30	9.72	10.16	10.62	11.09	11.59
Repairs																
Cost/Seeded Acre	INPUT	$5.67	5.93	6.19	6.47	6.76	7.07	7.38	7.72	8.06	8.43	8.81	9.20	9.62	10.05	10.50
Storage, Drying, Cleaning																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	$5.72	5.98	6.26	6.53	6.82	7.13	7.45	7.78	8.13	8.50	8.88	9.28	9.70	10.14	10.59

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mustard																
Purchased Seed																
Cost/bushel	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bushels Seeded/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizers																
Cost/Tonne	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonnes/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )																
Cost/Gallon	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Rental	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work																
Cost/Acre-Harvest	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance /Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hail Insurance/Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage, Drying, Cleaning																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous																
Cost/Seeded Acre	INPUT	$0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TAEM

TAEM

CIMP Premiums

Revenue Insurance Rates (Producer Share)																
Wheat	INPUT	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Barley	INPUT	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%
Canola	INPUT	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%

Producer Premium

Wheat	$2,026.88	$2,118.07	$2,213.38	$2,312.98	$2,417.07	$2,525.84	$2,639.50	$2,758.28	$2,882.40	$3,012.11	$3,147.85	$3,289.30	$3,437.31	$3,591.99	$3,753.63
Barley	$1,394.01	$1,456.74	$1,522.29	$1,590.79	$1,662.38	$1,737.19	$1,815.36	$1,897.05	$1,982.42	$2,071.63	$2,164.85	$2,262.27	$2,364.07	$2,470.48	$2,581.63
Canola	$1,864.35	$1,948.25	$2,035.92	$2,127.54	$2,223.27	$2,323.32	$2,427.87	$2,537.13	$2,651.30	$2,770.60	$2,895.28	$3,025.57	$3,161.72	$3,304.00	$3,452.68
Total	$5,285.22	$5,523.05	$5,771.59	$6,031.31	$6,302.72	$6,586.35	$6,882.73	$7,192.45	$7,516.11	$7,854.34	$8,207.78	$8,577.14	$8,963.11	$9,366.45	$9,787.94

STEP EIGHT: Input the costs of summer fallow

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fallow:																
Herbicides Cost/Acre	INPUT	$2.04	$2.13	$2.23	$2.33	$2.43	$2.54	$2.66	$2.78	$2.90	$3.03	$3.17	$3.31	$3.46	$3.62	$3.78
Equipment Rental Cost/Acre	INPUT	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Custom Work Cost/Acre	INPUT	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Cash Rent	INPUT	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Fuel and Oil Cost/Acre	INPUT	$3.52	$3.68	$3.84	$4.02	$4.20	$4.39	$4.58	$4.79	$5.01	$5.23	$5.47	$5.71	$5.97	$6.24	$6.52
Repairs Cost/Acre	INPUT	$3.01	$3.15	$3.29	$3.43	$3.59	$3.75	$3.92	$4.10	$4.28	$4.47	$4.67	$4.88	$5.10	$5.33	$5.57
Miscellaneous Cost/Acre	INPUT	$0.79	$0.83	$0.86	$0.90	$0.94	$0.98	$1.03	$1.08	$1.12	$1.17	$1.23	$1.28	$1.34	$1.40	$1.46

STEP NINE: Input the expected fixed expenses for the first year. These expenses are expected to increase at the rate of inflation per year but can be adjusted in any year below

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FIXED EXPENSES																
Hired Labour	INPUT	500	523	546	571	596	623	651	680	711	743	776	811	848	886	926
Property Taxes	INPUT	2,830	2,957	3,090	3,230	3,375	3,527	3,685	3,851	4,025	4,206	4,395	4,593	4,799	5,015	5,241
Power	INPUT	1,500	1,568	1,638	1,712	1,789	1,869	1,953	2,041	2,133	2,229	2,329	2,434	2,544	2,658	2,778
Telephone	INPUT	240	251	262	274	286	299	313	327	341	357	373	389	407	425	444
Insurance-Fire	INPUT	500	523	546	571	596	623	651	680	711	743	776	811	848	886	926
Insurance, Liscence Vehicles	INPUT	1,000	1,045	1,092	1,141	1,193	1,246	1,302	1,361	1,422	1,486	1,553	1,623	1,696	1,772	1,852
Building Upkeep	INPUT	300	314	328	342	358	374	391	408	427	446	466	487	509	532	556
General Overhead(tools, shop supp	INPUT	300	314	328	342	358	374	391	408	427	446	466	487	509	532	556
Accounting and Legal	INPUT	150	157	164	171	179	187	195	204	213	223	233	243	254	266	278

STEP TEN: Input the beginning amounts of debt, the expected payments and any new debt expected (to correspond with land or equipment purchases). Also input the Expected interest rate and payment each year

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Intermediate Debt Term Remaining	INPUT	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Begining Balance		50,000	42,264	35,758	30,241	25,574	21,626	18,290	15,468	13,081	11,062	9,355	7,912	6,691	5,658	4,785
Rate		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Payment		14,216	12,022	10,167	8,598	7,271	6,149	5,200	4,398	3,718	3,145	2,660	2,249	1,902	1,609	1,360
New Intermediate Debt		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Long Term Debt Term Remaining	INPUT	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Begining Balance		80,000	76,861	73,664	71,003	68,236	65,575	63,018	60,562	58,201	55,932	53,751	51,655	49,642	47,706	45,846
Rate		0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
Payment		13,519	12,992	12,485	11,999	11,531	11,081	10,649	10,234	9,835	9,452	9,083	8,728	8,388	8,062	7,747
New Long Term Debt		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STEP ELEVEN: Input the following

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Beg Net Worth(Equity)		300,000														
Addition to Net Worth(New Equity)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Recievable(% of Sales)	INPUT	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Inventory(% of Sales)	INPUT	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Accounts Payable(% of Expenses)	INPUT	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Expected Personal Tax Credits per Ye	INPUT	1,500	1,545	1,591	1,639	1,688	1,739	1,791	1,845	1,900	1,957	2,016	2,076	2,138	2,203	2,269

WOODLOT INPUT SECTION Note: Only incremental cash flows are required

STEP TWELVE: Input the expected quantity of woodlot sales by category, in terms of cubic meters

Former owned Land

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Logs:																
Pulpwood	INPUT	438	438	438	438	438	438	438	438	438	438	438	438	438	438	438
Sawlogs	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firewood	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fence Posts/Rails	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Christmas Trees	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Chips/Pellets	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		438	438	438	438	438	438	438	438	438	438	438	438	438	438	438

Former Leased Land

Logs:																
Pulpwood	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sawlogs	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firewood	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fence Posts/Rails	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Christmas Trees	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Chips/Pellets	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STEP THIRTEEN: Input the expected prices for each category of woodlot sales, per cubic meter.

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Logs:																
Pulpwood	INPUT	17.00	17.77	18.56	19.40	20.27	21.19	22.14	23.13	24.18	25.26	26.40	27.59	28.83	30.13	31.48
Sawlogs	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Firewood	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fence Posts/Rails	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Christmas Trees	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood Chips/Pellets	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STEP FOURTEEN: Input expected sales of woodlot related products and services.

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Recreation	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berries	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wildlife	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others:																
	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STEP FIFTEEN: Input direct logging costs per cubic meter
Note that hired labour expense is a separate category

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Stumpage fee/cubic meter	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Felling and bucking	INPUT	1.64	1.71	1.78	1.87	1.96	2.04	2.14	2.23	2.33	2.44	2.55	2.66	2.78	2.91	3.04
Yarding and skidding	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loading	INPUT	1.65	1.72	1.80	1.88	1.97	2.06	2.15	2.25	2.35	2.45	2.56	2.68	2.80	2.92	3.06
Hauling: (Use either custom rate or owner expenses)																
Fuel and Oil	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance and Repairs	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Rate	INPUT	10.23	10.68	11.17	11.67	12.20	12.75	13.32	13.92	14.55	15.20	15.88	16.60	17.35	18.13	18.95
Scaling	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slash Disposal	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landings, Skid roads	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other																
	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hired Labour (Can be hourly labour or piece work, or both)																
Projected hours per cubic meter	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labour rate per hour	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Piece rate per cubic meter	INPUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STEP SIXTEEN: Input indirect costs in terms of a dollar amount per year
Note: Only incremental costs are required

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Annual lease payment	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Property taxes	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Office expenses(telephone, postage,	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insurance	INPUT	150	157	164	171	178	187	195	204	213	223	233	243	254	266	278
Legal and accounting	INPUT	250	261	273	285	298	312	326	340	356	372	388	406	424	443	463
Association dues	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Travel	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subscriptions and Publications	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other:																
Miscellaneous	INPUT	750	784	818	856	894	935	977	1,021	1,067	1,115	1,165	1,217	1,272	1,329	1,388
	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Indirect Costs		1,150	1,202	1,256	1,312	1,371	1,433	1,498	1,565	1,635	1,709	1,786	1,866	1,950	2,038	2,130

STEP SEVENTEEN: Input costs of forest management in terms of dollar amounts

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cruising and inventory	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mapping	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planning	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protection	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Site supervision	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other:																
	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Forest Management Costs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STEP EIGHTEEN: Input costs of silviculture in terms of dollar amounts

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Site Preparation	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planting	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Surveys	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juvenile Spacing	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rehabilitation	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seed Extraction	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seedlings	INPUT	50	52	55	57	60	62	65	68	71	74	78	81	85	89	93
Weeding	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Silviculture Costs		50	52	55	57	60	62	65	68	71	74	78	81	85	89	93

STEP NINETEEN: Input incremental capital costs in dollar amounts and Financing

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Access Roads	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Logging and forestry Equipment	INPUT	2,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trucks	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Office Equipment	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buildings	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		2,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financing Required		2,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financing Source New Debt	INPUT	2,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Equity	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STEP TWENTY: NISA and RRSP Contribution
Note: Tell the program to "calculate" before inputing the NISA/RRSP amounts (For Excel press 'command' and '=' simultaneously)
(For Lotus press 'F9')

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NISA Account																
Current NISA balance	INPUT	0														
Maximum NISA Contribution		2,113	2,208	2,308	2,412	2,520	2,634	2,752	2,876	3,005	3,141	3,282	3,430	3,584	3,745	3,914
Beginning Balance		0	4,227	9,087	14,657	21,020	28,267	36,502	45,839	56,404	68,338	81,794	96,947	113,986	133,122	154,590
NISA Contribution	INPUT	2,113	2,208	2,308	2,412	2,520	2,634	2,752	2,876	3,005	3,141	3,282	3,430	3,584	3,745	3,914
Government Contribution		2,113	2,208	2,308	2,412	2,520	2,634	2,752	2,876	3,005	3,141	3,282	3,430	3,584	3,745	3,914
Interest		0	444	954	1,539	2,207	2,968	3,833	4,813	5,922	7,175	8,588	10,179	11,968	13,978	16,232
Ending Balance		4,227	9,087	14,657	21,020	28,267	36,502	45,839	56,404	68,338	81,794	96,947	113,986	133,122	154,590	178,650
Current RRSP balance	INPUT	20,000														
Maximum RRSP Contribution		0	1,518	2,069	4,229	5,345	6,354	7,283	8,154	8,984	9,783	10,560	11,328	12,094	12,865	13,645
Beginning Balance		20,000	21,800	23,762	25,901	28,232	30,772	33,542	36,561	39,851	43,438	47,347	51,609	56,253	61,316	66,835
RRSP Contribution	INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest		1,800	1,962	2,139	2,331	2,541	2,770	3,019	3,290	3,587	3,909	4,261	4,645	5,063	5,518	6,015
Ending Balance		21,800	23,762	25,901	28,232	30,772	33,542	36,561	39,851	43,438	47,347	51,609	56,253	61,316	66,835	72,850

FORECASTED STATEMENTS OF EARNINGS AND NET WORTH

TAEM

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SALES: Farm																
Wheat	Sales	27,390	28,623	29,911	31,257	32,663	34,133	35,669	37,274	38,951	40,704	42,536	44,450	46,450	48,540	50,725
	COGS	8,170	8,538	8,922	9,323	9,743	10,181	10,639	11,118	11,618	12,141	12,688	13,259	13,855	14,479	15,130
	Gross Profit	19,220	20,085	20,988	21,933	22,920	23,952	25,029	26,156	27,333	28,563	29,848	31,191	32,595	34,062	35,594
Wheat (Durum)	Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	COGS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gross Profit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Malt	Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	COGS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gross Profit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Reg	Sales	19,006	19,956	20,953	21,792	22,772	23,797	24,868	25,987	27,156	28,378	29,656	30,990	32,385	33,842	35,365
	COGS	6,417	6,708	7,008	7,323	7,653	7,997	8,357	8,733	9,126	9,537	9,966	10,414	10,883	11,373	11,884
	Gross Profit	12,679	13,249	13,845	14,469	15,120	15,800	16,511	17,254	18,030	18,842	19,690	20,576	21,502	22,469	23,480
Lentils	Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	COGS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gross Profit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canola	Sales	38,048	39,760	41,549	43,418	45,373	47,415	49,548	51,778	54,108	56,543	59,087	61,746	64,525	67,429	70,463
	COGS	10,321	10,786	11,271	11,778	12,308	12,862	13,441	14,046	14,678	15,338	16,029	16,750	17,504	18,291	19,114
	Gross Profit	27,727	28,975	30,278	31,641	33,065	34,553	36,108	37,732	39,430	41,206	43,059	44,997	47,021	49,137	51,348
Mustard	Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	COGS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gross Profit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fallow	COGS	1,778	1,858	1,942	2,028	2,121	2,216	2,316	2,420	2,529	2,643	2,762	2,888	3,016	3,152	3,293
Total Farm Sales		84,534	88,338	92,313	96,467	100,808	105,348	110,085	115,030	120,216	125,626	131,279	137,186	143,360	149,811	156,552
SALES: Woodlot																
Logs:																
Pulpwood		7,438	7,772	8,122	8,487	8,869	9,268	9,686	10,121	10,577	11,053	11,550	12,070	12,613	13,181	13,774
Sawlogs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulpwood		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sawlogs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firewood		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fence Posts/Rails		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Christmas Trees		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Chips/Pellets		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recreation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Berries		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wildlife		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others:																
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Woodlot Sales		7,438	7,772	8,122	8,487	8,869	9,268	9,686	10,121	10,577	11,053	11,550	12,070	12,613	13,181	13,774
Total Farm-Woodlot Sales		91,972	96,110	100,435	104,955	109,678	114,613	119,771	125,151	130,793	136,678	142,829	149,256	155,973	162,992	170,326
Total Cost of Goods Sold		37,887	39,592	41,374	43,235	45,181	47,214	49,339	51,559	53,879	56,304	58,838	61,485	64,252	67,143	70,165
Total Gross Profit		54,084	56,518	59,062	61,719	64,497	67,399	70,432	73,601	76,913	80,375	83,991	87,771	91,721	95,848	100,161
Fixed Expenses		55,113	48,085	42,569	38,226	34,802	32,100	29,971	28,301	27,001	26,022	25,326	24,840	24,533	24,378	24,355
Operating Profit (Loss)		-1,029	8,433	16,493	23,493	29,695	35,299	40,461	45,300	49,913	54,352	58,666	62,931	67,188	71,470	75,806
Other Income	(Expense)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Income		0	633	1,030	1,694	2,486	3,416	4,460	5,601	6,846	8,211	9,711	11,321	13,048	14,899	16,881
Earnings (Loss) Before Taxes		-1,029	9,066	17,522	25,187	32,181	38,716	44,921	50,902	56,759	62,563	68,376	74,252	80,236	86,369	92,687
Income Taxes		0	181	2,501	4,600	7,051	9,737	12,349	14,900	17,405	20,153	22,893	25,881	28,508	31,406	34,391
Net Earnings (Loss)		-1,029	8,886	15,021	20,587	25,130	28,979	32,572	36,001	39,356	42,410	45,473	48,371	51,727	54,963	58,296
Net Worth, Beginning		300,000	283,344	276,048	273,962	276,805	283,420	293,079	305,469	320,451	337,846	357,337	378,889	402,490	428,152	455,905
Less Dividends		15,000	15,675	16,380	17,117	17,888	18,693	19,534	20,413	21,332	22,291	23,295	24,343	25,438	26,583	27,779
Less MSA Contribution		2,113	2,208	2,308	2,412	2,520	2,634	2,752	2,876	3,005	3,141	3,282	3,430	3,584	3,745	3,914
Less RRSP Contribution		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plus Equity Contribution		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Worth, Ending		283,344	275,948	273,962	276,805	283,420	293,079	305,469	320,451	337,846	357,337	378,889	402,490	428,152	455,905	485,795

FORECASTED BALANCE SHEETS

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ASSETS															
Cash	9737	15842	26087	38251	52558	68614	86178	105323	126321	149395	174170	200742	229218	259702	292302
Accounts Receivable	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inventory	16907	17666	18463	19293	20162	21069	22017	23008	24043	25125	26256	27437	28672	29962	31310
Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Current Assets	26644	33509	44550	57544	72720	89683	108193	128331	150364	174520	200426	228179	257890	289664	323613
Machinery and Equipment	112100	112100	112100	112100	112100	112100	112100	112100	112100	112100	112100	112100	112100	112100	112100
Less: Accumulated Depredation	-24420	-43358	-58085	-69574	-78559	-85604	-91138	-95495	-98931	-101646	-103793	-105484	-106842	-107914	-108765
Breeding Stock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Intermediate Assets	87680	68744	54015	42526	33541	26496	20962	16605	13169	10454	8307	6616	5257	4186	3335
Land	275000	275000	275000	275000	275000	275000	275000	275000	275000	275000	275000	275000	275000	275000	275000
Building & Improvements	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
Less: Accumulated Depredation	-5000	-8500	-13550	-17195	-20476	-23428	-26065	-28477	-30629	-32588	-34309	-35870	-37281	-38562	-39705
Total Net Fixed Assets	320000	316500	311450	307805	304525	301572	298915	296523	294371	292434	290691	289121	287709	286438	285295
Total Assets	434324	417753	409995	407875	410785	417752	428070	441459	457904	477408	499423	523907	550856	580288	612243
NISA Balance	4227	9087	14657	21020	28267	36502	45839	56404	68338	81784	96947	113986	133122	154590	178650
RRSP Balance	21800	23762	25901	28232	30772	33542	36561	39851	43436	47347	51609	56253	61316	66835	72850
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIABILITIES and NET WORTH															
Accounts and Rent Payable	28811	29908	29324	29848	30473	31183	32003	32900	33881	34954	36123	37375	38711	40131	41636
Dividends Payable	1250	1306	1365	1428	1491	1558	1628	1701	1778	1858	1941	2029	2120	2215	2315
Income Taxes Payable	0	161	2501	4600	7051	9737	12349	14900	17405	20153	22903	25681	28508	31408	34381
Other Current Liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Current Liabilities	29861	30375	33190	35874	39015	42487	45980	49502	53064	56965	60967	65084	69339	73752	78342
Intermediate Debt Payable	42284	35759	30241	25574	21628	18280	15466	13081	11062	9355	7912	6691	5658	4785	4047
Farm Real Estate Mortgage	76881	73884	71003	68235	65575	63018	60562	58201	55932	53751	51655	49642	47708	45846	44058
Woodlot Debt	1953	1787	1599	1387	1147	877	571	225	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Long Term Liabilities	78834	75671	72603	69622	66722	63895	61132	58425	55932	53751	51655	49642	47708	45846	44058
Total Liabilities	150876	141805	136033	131071	127365	124673	122580	121008	120058	120071	120534	121417	122704	124384	126448
Net Worth - Retained Earnings	283344	275948	273962	276805	283420	293079	305489	320451	337846	357337	378889	402490	428152	455905	485795
Total Liabilities and Net Worth	434324	417753	409995	407875	410785	417752	428070	441459	457904	477408	499423	523907	550856	580288	612243

FORECASTED STATEMENTS OF CHANGES IN FINANCIAL POSITION

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SOURCES (USES) OF CASH															
Net Earnings (Loss)	-1028	6906	15021	20587	25130	28979	32572	36001	39354	42410	45473	48571	51727	54963	58298
Depredation(CCA)	28420	23438	18778	15134	12288	9997	8192	6749	5589	4652	3891	3270	2761	2342	1995
Cash Provided By Operations	28391	32342	33800	35721	37398	38975	40763	42750	44942	47061	49364	51841	54488	57305	60290
Dividends, RRSP and NISA Cont	-15627	-16302	-17007	-17744	-18515	-19320	-20161	-21040	-21958	-22918	-23922	-24970	-26065	-27210	-28406
Cash Provided By (Used For) Changes In															
Accounts Receivable	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inventory	-2407	-761	-795	-831	-868	-907	-948	-991	-1035	-1082	-1131	-1182	-1235	-1290	-1348
Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	5111	297	416	524	625	720	810	897	981	1072	1169	1252	1338	1420	1506
Income Taxes	0	161	2340	2099	2451	2686	2812	2551	2505	2748	2750	2777	2828	2898	2985
Dividends Payable	1250	56	59	61	64	67	70	73	77	80	84	87	91	95	100
Other Current Liabilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Provided By (Used For) Operating Activities	3954	-246	2018	1853	2272	2565	2546	2531	2527	2819	2872	2936	3020	3123	3242

TAEM

Investment Transactions																
Machinery & Equipment	-2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Breeding Stock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Building & Improvements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net Cash From Investment Transactions	-2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Financing Transactions																
Intermediate Term Debt	-7716	-6525	-5518	-4667	-3947	-3337	-2822	-2387	-2018	-1707	-1444	-1221	-1032	-873	-738	
Long-Term Debt	-1166	-3163	-3068	-2980	-2900	-2827	-2763	-2707	-2494	-2181	-2096	-2014	-1935	-1860	-1787	
Equity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Net Cash From Financing Transactions	-8882	-9688	-8586	-7647	-6846	-6165	-5585	-5094	-4512	-3888	-3539	-3235	-2968	-2733	-2526	
Net Increase (Decrease) In Cash	5737	6105	10228	12183	14307	16056	17562	18147	20998	23074	24775	26572	28478	30485	32600	
Cash-Beginning Of Year	4000	9737	15842	26067	38251	52558	68614	86176	105323	126321	149395	174170	200742	229218	259702	
Cash-End Of Year	9737	15842	26067	38251	52558	68614	86176	105323	126321	149395	174170	200742	229218	259702	292302	
FINANCIAL RATIO ANALYSIS																
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Overall Performance																
Return on Equity	0.00	0.03	0.05	0.07	0.09	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	
Return on Total Assets	0.00	0.02	0.04	0.05	0.06	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	
Profitability Measures																
Gross Profit Margin	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	
Net Profit Margin	-0.01	0.10	0.16	0.21	0.25	0.28	0.30	0.31	0.33	0.34	0.35	0.35	0.36	0.37	0.37	
Test of Investment Utilization																
Asset Turnover	0.19	0.21	0.23	0.24	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	
Equity Turnover	0.30	0.32	0.34	0.35	0.36	0.36	0.36	0.36	0.36	0.35	0.35	0.34	0.33	0.33	0.32	
Fixed Asset Turnover	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.41	0.43	0.45	0.47	0.50	0.52	0.55	
Test of Financial Condition																
Current Ratio	0.89	1.10	1.34	1.60	1.86	2.11	2.35	2.59	2.83	3.06	3.29	3.51	3.72	3.93	4.13	
Quick Ratio	0.33	0.52	0.78	1.07	1.35	1.61	1.87	2.13	2.36	2.62	2.86	3.08	3.31	3.52	3.73	
Financial Leverage																
Total Assets/Equity	1.53	1.51	1.50	1.47	1.46	1.43	1.40	1.38	1.36	1.34	1.32	1.30	1.29	1.27	1.26	
Debt/Equity	0.53	0.51	0.50	0.47	0.46	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.09	0.08	0.07	
Debt to Total Assets	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.27	0.26	0.25	0.24	0.23	0.22	0.21	0.21	
TAX WORK SHEET FOR ABOVE MODEL																
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Taxable Income	0	1	2	3	4	5	5	5	5	5	5	5	5	5	5	
Net Income	1029	8066	17522	25187	32181	38716	44021	50902	56759	62563	68376	74252	80236	86369	92687	
Minus RRSP Cont	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Add Back Personal Expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Before Averaging	1029	8066	17522	25187	32181	38716	44021	50902	56759	62563	68376	74252	80236	86369	92687	
Taxable Income (Loss)	1029	8038	17522	25187	32181	38716	44021	50902	56759	62563	68376	74252	80236	86369	92687	
Federal Tax Payable	0	1366	2979	4282	5822	7521	9135	10690	12218	13903	15588	17292	18928	20806	22638	
Income Averaging	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Minus Investment Tax Credits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Minus Personal Tax Credits	1500	1545	1591	1639	1688	1739	1791	1845	1900	1957	2016	2078	2139	2203	2269	
Basic Federal Tax	0	0	1387	2643	4134	5782	7343	8845	10319	11945	13572	15216	16889	18603	20369	
Federal Surtax (5%)	0	0	69	132	207	288	367	442	516	597	679	761	844	930	1018	
Saskatchewan Tax (50%)	0	0	694	1321	2067	2891	3672	4422	5160	5973	6786	7608	8444	9302	10185	
Saskatchewan Flat Tax (2.0%)	0	161	350	504	644	774	898	1018	1135	1251	1368	1485	1605	1727	1854	
Saskatchewan Surtax	0	0	0	0	0	0	68	173	276	387	498	611	726	843	965	
Total Tax Payable	0	161	2501	4600	7051	9737	12349	14900	17405	20153	22903	25681	28508	31406	34391	

TAEM

TAEM

DETAILS FOR STATEMENTS OF EARNINGS

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CROP PRODUCTION															
Acres Forecasted															
Wheat	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Wheat (Durum)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Malt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Reg	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Lentils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canola	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Mustard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Seeded Acres	560	560	560	560	560	560	560	560	560	560	560	560	560	560	560
Fallow	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
Total Acres	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Yields Forecasted															
Wheat	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Wheat (Durum)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Malt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Reg	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Lentils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canola	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Mustard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prices Forecasted															
Wheat	4.15	4.34	4.53	4.74	4.95	5.17	5.40	5.65	5.90	6.17	6.44	6.73	7.04	7.35	7.69
Wheat (Durum)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barley Malt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barley Reg	2.17	2.27	2.37	2.48	2.58	2.70	2.83	2.95	3.08	3.22	3.37	3.52	3.68	3.85	4.02
Lentils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canola	6.56	6.86	7.16	7.48	7.82	8.17	8.54	8.93	9.33	9.75	10.19	10.65	11.12	11.63	12.15
Mustard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dollar Sales Forecasted															
Wheat	27,390	28,623	29,911	31,257	32,663	34,133	35,669	37,274	38,951	40,704	42,536	44,450	46,450	48,540	50,725
Wheat (Durum)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Malt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barley Reg	19,096	19,955	20,853	21,792	22,772	23,797	24,868	25,987	27,156	28,378	29,656	30,990	32,385	33,842	35,365
Lentils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canola	38,048	39,760	41,548	43,419	45,373	47,415	49,548	51,778	54,108	56,543	59,087	61,746	64,525	67,428	70,463
Mustard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Dollar Sales	84,534	88,338	92,313	96,467	100,808	105,345	110,085	115,039	120,216	125,626	131,279	137,186	143,360	149,811	156,552
COST OF SALES (Farm)															
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Wheat															
Purchased Seed	1162.00	1214.29	1268.83	1326.04	1385.71	1448.06	1513.23	1581.32	1652.48	1726.84	1804.55	1885.76	1970.61	2059.29	2151.96
Cost/bushel	4.15	4.34	4.53	4.74	4.95	5.17	5.40	5.65	5.90	6.17	6.44	6.73	7.04	7.35	7.69
Bushels Seeded/Acre	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Fertilizers	2268.00	2370.06	2476.71	2588.18	2704.63	2826.34	2953.53	3086.43	3225.32	3370.48	3522.13	3680.83	3846.26	4019.34	4200.21
Cost/Tonne	315.00	329.18	343.98	359.47	375.64	392.55	410.21	428.67	447.98	468.12	489.18	511.20	534.20	558.24	583.36
Tonnes/Acre	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Herbicides( )	1392.00	1454.64	1520.10	1588.50	1659.99	1734.69	1812.75	1894.32	1979.56	2068.64	2161.73	2259.01	2360.67	2466.90	2577.91
Cost/Gallon	10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )	104.00	108.68	113.57	118.68	124.02	129.60	135.44	141.53	147.90	154.55	161.51	168.78	176.37	184.31	193.60
Cost/Gallon	10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.05
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance	630.00	658.35	687.98	718.93	751.28	785.09	820.42	857.34	895.92	936.24	978.37	1022.40	1068.41	1116.48	1166.73
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil	1173.00	1224.74	1279.85	1337.45	1397.63	1460.53	1526.25	1594.93	1666.70	1741.70	1820.08	1901.98	1987.57	2077.01	2170.48
Cost/Seeded Acre	5.86	6.12	6.40	6.68	6.99	7.30	7.63	7.97	8.33	8.71	9.10	9.51	9.94	10.39	10.85
Repa[redacted]	952.00	994.64	1039.61	1086.39	1135.28	1186.37	1239.75	1295.54	1353.84	1414.76	1478.43	1544.96	1614.48	1687.13	1763.05

Cost/Seeded Acre	4.76	4.97	5.20	5.43	5.68	5.93	6.20	6.48	6.77	7.07	7.39	7.72	8.07	8.44	8.82	
Storage, Drying, Cleaning	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Miscellaneous	490.00	512.05	535.09	559.17	584.33	610.63	638.11	666.82	696.83	728.19	760.96	795.20	830.98	868.38	907.45	
Cost/Seeded Acre	2.45	2.56	2.68	2.80	2.92	3.05	3.19	3.33	3.48	3.64	3.80	3.98	4.15	4.34	4.54	
Cost of Sales- Wheat	8170.00	8537.65	8921.84	9323.33	9742.88	10181.31	10639.47	11118.24	11618.56	12141.40	12687.76	13258.71	13855.25	14478.64	15130.39	
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Wheat (Durum)																
Purchased Seed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/bushel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Bushels Seeded/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Tonne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Tonnes/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Insecticides ( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Crop Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fuel and Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Storage, Drying, Cleaning	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Miscellaneous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost of Sales- Wheat (Durum)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Barley Malt																
Purchased Seed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/bushel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Bushels Seeded/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Tonne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Tonnes/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Insecticides ( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Crop Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fuel and Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Storage, Drying, Cleaning	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

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Miscellaneous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost of Sales- Barley Malt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barley Reg															
Purchased Seed	486.08	507.95	530.81	554.70	579.68	605.74	633.00	661.49	691.25	722.38	754.87	788.84	824.33	861.43	900.19
Cost/bushel	2.17	2.27	2.37	2.48	2.58	2.70	2.83	2.95	3.09	3.22	3.37	3.52	3.68	3.85	4.02
Bushels Seeded/Acre	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Fertilizers	1814.40	1896.05	1981.37	2070.53	2163.71	2261.07	2362.82	2469.15	2580.26	2696.37	2817.71	2944.50	3077.01	3215.47	3360.17
Cost/Tonne	315.00	329.18	343.99	359.47	375.64	392.55	410.21	428.67	447.96	468.12	489.18	511.20	534.20	558.24	583.36
Tonnes/Acre	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Herbicides( )	1120.00	1170.40	1223.07	1278.11	1335.62	1395.72	1458.63	1524.17	1592.75	1664.43	1739.33	1817.60	1899.39	1984.88	2074.18
Cost/Gallon	10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )	48.00	50.16	52.42	54.78	57.24	59.82	62.51	65.32	68.26	71.33	74.54	77.90	81.40	85.07	88.89
Cost/Gallon	10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance	300.80	314.34	328.48	343.26	358.71	374.85	391.72	409.35	427.77	447.02	467.13	488.15	510.12	533.08	557.07
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil	1033.60	1080.11	1128.72	1179.51	1232.59	1288.05	1346.02	1406.59	1469.88	1536.03	1605.15	1677.36	1752.86	1831.74	1914.17
Cost/Seeded Acre	6.46	6.75	7.06	7.37	7.70	8.05	8.41	8.79	9.19	9.60	10.03	10.48	10.96	11.45	11.96
Repairs	1008.80	1055.03	1102.51	1152.12	1203.97	1258.15	1314.78	1373.93	1435.75	1500.36	1567.88	1638.43	1712.18	1789.21	1869.72
Cost/Seeded Acre	6.31	6.59	6.89	7.20	7.52	7.86	8.22	8.59	8.97	9.38	9.80	10.24	10.70	11.18	11.68
Storage, Drying, Cleaning	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous	604.80	632.02	660.46	690.18	721.24	753.69	787.61	823.05	860.08	898.79	939.24	981.50	1025.67	1071.82	1120.06
Cost/Seeded Acre	3.78	3.95	4.13	4.31	4.51	4.71	4.92	5.14	5.38	5.62	5.87	6.13	6.41	6.70	7.00
Cost of Sales- Barley Reg	8417.28	8706.06	7007.83	7323.18	7652.73	7997.10	8356.97	8733.03	9126.02	9536.69	9965.84	10414.30	10882.95	11372.68	11884.45
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Lentils															
Purchased Seed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/bushel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bushels Seeded/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Tonne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonnes/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cost/Seeded Acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TAEM

Cost of Sales- Canola	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Canola															
Purchased Seed	1443.20	1508.14	1576.01	1646.93	1721.04	1798.49	1879.42	1964.00	2052.38	2144.73	2241.25	2342.10	2447.50	2557.63	2672.73
Cost/bushel	6.56	6.86	7.16	7.49	7.82	8.17	8.54	8.93	9.33	9.75	10.19	10.65	11.12	11.63	12.15
Bushels Seeded/Acre	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Fertilizers	1890.00	1976.05	2063.93	2156.80	2253.88	2355.28	2461.27	2572.03	2687.77	2808.72	2935.11	3067.19	3205.22	3349.45	3500.18
Cost/Tonne	315.00	329.18	343.98	359.47	375.64	392.55	410.21	428.67	447.96	468.12	489.19	511.20	534.20	558.24	583.36
Tonnes/Acre	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Herbicides( )	2538.00	2652.21	2771.56	2896.28	3026.61	3162.81	3305.14	3453.87	3609.28	3771.71	3941.44	4118.80	4304.18	4497.83	4700.24
Cost/Gallon	10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecticides ( )	188.00	196.46	205.30	214.54	224.19	234.28	244.82	255.84	267.35	279.39	291.96	305.10	318.83	333.17	348.17
Cost/Gallon	10.00	10.45	10.92	11.41	11.93	12.46	13.02	13.61	14.22	14.86	15.53	16.23	16.96	17.72	18.52
Gallons/Acre	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance	732.00	764.94	799.36	835.33	872.92	912.21	953.25	996.15	1040.98	1087.82	1136.77	1187.93	1241.38	1297.25	1355.62
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil	1252.00	1308.34	1367.22	1428.74	1493.03	1560.22	1630.43	1703.80	1780.47	1860.59	1944.32	2031.81	2123.24	2218.78	2318.64
Cost/Seeded Acre	8.26	8.64	8.84	7.14	7.47	7.80	8.15	8.52	8.90	9.30	9.72	10.16	10.62	11.09	11.59
Repairs	1134.00	1185.03	1238.36	1294.08	1352.32	1413.17	1476.76	1543.22	1612.68	1685.23	1761.07	1840.32	1923.13	2009.67	2100.11
Cost/Seeded Acre	5.67	5.93	6.19	6.47	6.76	7.07	7.38	7.72	8.06	8.43	8.81	9.20	9.62	10.05	10.50
Storage, Drying, Cleaning	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous	1144.00	1195.48	1249.28	1305.48	1364.24	1425.63	1489.79	1556.83	1626.86	1700.00	1776.40	1856.54	1940.08	2027.38	2118.82
Cost/Seeded Acre	5.72	5.98	6.25	6.53	6.82	7.13	7.45	7.78	8.13	8.50	8.88	9.28	9.70	10.14	10.59
Cost of Sales- Canola	10321.20	10785.65	11271.01	11778.20	12308.22	12862.09	13440.89	14045.73	14677.78	15338.29	16028.51	16749.79	17503.53	18291.19	19114.29
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mustard															
Purchased Seed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/bushel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bushels Seeded/Acre	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Tonne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tonnes/Acre	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Herbicides( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Insecticides ( )	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Gallon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gallons/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Harvest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre-Spray	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Custom($)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crop Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hail Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Storage, Drying, Cleaning	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Seeded Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost of Sales- Mustard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TAEM

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fallow:															
Herbicides	387.60	405.04	423.27	442.32	462.22	483.02	504.76	527.47	551.21	576.01	601.93	629.02	657.32	686.90	717.81
Cost/Acre	2.04	2.13	2.23	2.33	2.43	2.54	2.66	2.78	2.90	3.03	3.17	3.31	3.46	3.62	3.78
Equipment Rental	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom Work	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost/Acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash Rent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel and Oil	668.80	688.80	730.35	763.21	797.56	833.45	870.95	910.14	951.10	993.90	1038.63	1085.36	1134.21	1185.24	1238.58
Cost/Acre	3.52	3.68	3.84	4.02	4.20	4.38	4.58	4.79	5.01	5.23	5.47	5.71	5.97	6.24	6.52
Repairs	571.90	597.64	624.53	652.63	682.00	712.69	744.76	778.28	813.30	849.90	888.14	928.11	969.87	1013.52	1059.13
Cost/Acre	3.01	3.15	3.29	3.43	3.59	3.75	3.92	4.10	4.28	4.47	4.67	4.88	5.10	5.33	5.57
Miscellaneous	150.10	156.86	163.91	171.28	179.00	187.05	195.47	204.27	213.48	223.08	233.10	243.59	254.65	266.01	277.98
Cost/Acre	0.79	0.83	0.86	0.90	0.94	0.98	1.03	1.08	1.12	1.17	1.23	1.28	1.34	1.40	1.46
Cost of Sales- Fallow	1778.40	1858.43	1942.06	2029.45	2120.78	2216.21	2315.94	2420.16	2529.08	2642.87	2761.40	2885.08	3015.08	3151.67	3293.50
GRIP Premiums															
Revenue Insurance Rates (Producer Share)															
Wheat INPUT	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%
Barley INPUT	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%
Canola INPUT	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%
Producer Premium															
Wheat	2,027	2,118	2,213	2,313	2,417	2,526	2,639	2,758	2,882	3,012	3,148	3,288	3,437	3,592	3,754
Barley	1,384	1,457	1,522	1,591	1,662	1,737	1,815	1,897	1,982	2,072	2,165	2,262	2,364	2,470	2,582
Canola	1,864	1,948	2,038	2,128	2,223	2,323	2,428	2,537	2,651	2,771	2,895	3,026	3,162	3,304	3,453
Total	5,285	5,523	5,772	6,031	6,303	6,586	6,883	7,192	7,516	7,854	8,208	8,577	8,963	9,366	9,788
FIXED EXPENSES															
Hired Labour	500	523	546	571	596	623	651	680	711	743	776	811	848	886	926
Depreciation(CCA)	20420	23436	18778	15134	12266	9967	8192	6749	5589	4652	3881	3270	2761	2342	1995
Property Taxes	2830	2957	3090	3230	3375	3527	3685	3851	4025	4206	4395	4593	4799	5015	5241
Power	1500	1568	1638	1712	1789	1869	1953	2041	2133	2229	2329	2434	2544	2658	2778
Telephone	240	251	262	274	286	299	313	327	341	357	373	388	407	426	444
Insurance-Fire	500	523	546	571	596	623	651	680	711	743	776	811	848	886	926
Insurance, Liscence-Vehicles	1000	1045	1092	1141	1193	1246	1302	1361	1422	1486	1553	1623	1696	1772	1852
Building Upkeep	300	314	328	342	358	374	391	408	427	446	466	487	509	532	556
General Overhead(tools, shop supplies, etc	300	314	328	342	358	374	391	408	427	446	466	487	509	532	556
Accounting and Legal	150	157	164	171	179	187	195	204	213	223	233	243	254	266	278
Interest- operating loans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest- Intermediate	6500	5407	4649	3931	3325	2812	2378	2011	1701	1438	1216	1029	870	736	622
Interest- Long Term	10400	9906	9605	9230	8671	8525	8192	7873	7568	7271	6988	6715	6453	6202	5960
Total Fixed Expenses	53840	46577	41026	36849	33180	30455	28294	26594	25265	24239	23462	22893	22498	22252	22133
Expected Inflation Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Operating Loan Rate	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
T-Bill Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Intermediate Debt															
Beginning Balance	50,000	42,284	35,759	30,241	25,574	21,628	18,290	15,468	13,081	11,062	9,355	7,912	6,691	5,658	4,785
Rate	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Payment	14,216	12,022	10,167	8,598	7,271	6,149	5,200	4,398	3,719	3,145	2,660	2,249	1,902	1,609	1,360
Interest	6,500	5,497	4,649	3,931	3,325	2,812	2,378	2,011	1,701	1,438	1,216	1,029	870	736	622
Principal	7,716	6,526	5,518	4,667	3,947	3,337	2,822	2,387	2,018	1,707	1,444	1,221	1,032	873	738
New Intermediate Debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balance Remaining	42,284	35,759	30,241	25,574	21,628	18,290	15,468	13,081	11,062	9,355	7,912	6,691	5,658	4,785	4,047
Long Term Debt															
Beginning Balance	80,000	76,881	73,884	71,003	68,235	65,575	63,018	60,562	58,201	55,932	53,751	51,655	49,642	47,708	45,846
Rate	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Payment	13,519	12,992	12,486	11,999	11,531	11,081	10,648	10,234	9,835	9,452	9,083	8,729	8,389	8,062	7,747
Interest	10,400	9,905	9,605	9,230	8,671	8,525	8,192	7,873	7,568	7,271	6,988	6,715	6,453	6,202	5,960
Principal	3,119	2,997	2,880	2,768	2,660	2,557	2,457	2,361	2,268	2,181	2,096	2,014	1,936	1,860	1,787
New Long Term Debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balance Remaining	76,881	73,884	71,003	68,235	65,575	63,018	60,562	58,201	55,932	53,751	51,655	49,642	47,708	45,846	44,059
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Land Purchase and Sale															
Beginning Land Inventory	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000
Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Land Inventory	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000	275,000

[redacted] CCA S[redacted] (Wood[redacted]d)

Class 6 Buildings	0.10															
Opening Balance		50,000	45,000	40,500	36,450	32,805	29,525	26,572	23,915	21,523	19,371	17,434	15,691	14,121	12,709	11,438
Net Additions(subtractions)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
End Balance before CCA		50,000	45,000	40,500	36,450	32,805	29,525	26,572	23,915	21,523	19,371	17,434	15,691	14,121	12,709	11,438
CCA		5,000	4,500	4,050	3,645	3,281	2,952	2,657	2,391	2,152	1,937	1,743	1,569	1,412	1,271	1,144
Closing Balance		45,000	40,500	36,450	32,805	29,525	26,572	23,915	21,523	19,371	17,434	15,691	14,121	12,709	11,438	10,295
Class 8 Machinery	0.20															
Opening Balance		90,000	73,680	58,944	47,155	37,724	30,178	24,143	19,315	15,452	12,361	9,889	7,911	6,329	5,063	4,051
Net Additions(subtractions)		2,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
End Balance before CCA		92,100	73,680	58,944	47,155	37,724	30,178	24,143	19,315	15,452	12,361	9,889	7,911	6,329	5,063	4,051
CCA		18,420	14,736	11,788	9,431	7,545	6,036	4,829	3,863	3,090	2,472	1,978	1,582	1,266	1,013	810
Closing Balance		73,680	58,944	47,155	37,724	30,178	24,143	19,315	15,452	12,361	9,889	7,911	6,329	5,063	4,051	3,240
Class 10 Trucks	0.30															
Opening Balance		20,000	14,000	9,800	6,860	4,802	3,361	2,353	1,647	1,153	807	565	395	277	194	136
Net Additions(subtractions)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
End Balance before CCA		20,000	14,000	9,800	6,860	4,802	3,361	2,353	1,647	1,153	807	565	395	277	194	136
CCA		6,000	4,200	2,940	2,058	1,441	1,008	706	494	346	242	169	119	83	58	41
Closing Balance		14,000	9,800	6,860	4,802	3,361	2,353	1,647	1,153	807	565	395	277	194	136	95
Woodlot Schedules																
Direct Costs																
Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Stumpage fee		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Felling and bucking		718	750	784	819	856	894	934	976	1,020	1,066	1,114	1,164	1,217	1,272	1,329
Yarding and skidding		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loading		722	754	788	824	861	900	940	982	1,027	1,073	1,121	1,171	1,224	1,279	1,337
Hauling																
Fuel, oil and repair		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Custom Rate		4,476	4,677	4,887	5,107	5,337	5,577	5,828	6,091	6,365	6,651	6,951	7,263	7,590	7,932	8,289
Scaling		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slash Disposal		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landings, Skid roads		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other																
0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hired Labour																
Hourly Labour		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Piece Work		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Woodlot Costs(Add to COGS)		5,916	6,181	6,458	6,750	7,054	7,371	7,703	8,049	8,412	8,790	9,186	9,598	10,031	10,483	10,954
Total Indirect Costs		1,150	1,202	1,256	1,312	1,371	1,433	1,498	1,565	1,635	1,709	1,786	1,866	1,950	2,038	2,130
Total Forest Management Costs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Silviculture Costs		50	52	55	57	60	62	65	68	71	74	78	81	85	89	93
Interest Expense		273	254	232	208	180	148	114	74	28	0	0	0	0	0	0
Addition to Fixed Costs		1,473	1,508	1,543	1,577	1,611	1,645	1,677	1,707	1,736	1,763	1,864	1,947	2,035	2,127	2,222
Incremental Long Term Debt																
Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Beginning Balance		2,100	1,853	1,767	1,566	1,367	1,147	877	571	225	0	0	0	0	0	0
Rate		13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Payment		420	420	420	420	420	420	420	420	254	0	0	0	0	0	0
Interest		273	254	232	208	180	148	114	74	28	0	0	0	0	0	0
Principal		147	166	188	212	240	271	306	346	226	0	0	0	0	0	0
New Long Term Debt		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balance Remaining		1,953	1,787	1,599	1,387	1,147	877	571	225	0	0	0	0	0	0	0
RRSP																
Beg of year Balance		20,000	21,800	23,762	25,901	28,232	30,772	33,542	36,561	39,851	43,436	47,347	51,609	56,253	61,316	66,835
Addition		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest		1,800	1,962	2,139	2,331	2,541	2,770	3,018	3,290	3,587	3,909	4,261	4,645	5,063	5,518	6,015
End of year Balance		21,800	23,762	25,901	28,232	30,772	33,542	36,561	39,851	43,436	47,347	51,609	56,253	61,316	66,835	72,850
NISA																
Beginning Balance		0	4,227	9,067	14,657	21,020	28,267	36,502	45,830	56,404	68,336	81,704	96,947	113,986	133,122	154,590
NISA Contribution		2,113	2,208	2,306	2,412	2,520	2,634	2,752	2,878	3,005	3,141	3,282	3,430	3,584	3,745	3,914
Government Contribution		2,113	2,208	2,306	2,412	2,520	2,634	2,752	2,878	3,005	3,141	3,282	3,430	3,584	3,745	3,914
Interest		0	444	954	1,539	2,207	2,968	3,833	4,813	5,922	7,176	8,588	10,178	11,968	13,978	18,232
Ending Balance		4,227	9,087	14,657	21,020	28,267	36,502	45,839	56,404	68,336	81,794	96,947	113,986	133,122	154,590	178,650

TAEM

FARM WOODLOT ASSOCIATION OF SASKATCHEWAN

Economic Feasibility Analysis

Financial Summary

A. Projected Income Statements

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sales															
Farm	84,534	88,338	92,313	96,467	100,808	105,345	110,085	115,039	120,216	125,626	131,278	137,186	143,360	149,811	156,552
Woodlot	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Sales	84,534	88,338	92,313	96,467	100,808	105,345	110,085	115,039	120,216	125,626	131,278	137,186	143,360	149,811	156,552
Cost of Goods Sold	31,972	33,411	34,914	36,485	38,127	39,843	41,636	43,510	45,468	47,514	49,652	51,886	54,221	56,661	59,211
Gross Profit	52,562	54,927	57,399	59,982	62,681	65,502	68,449	71,529	74,748	78,112	81,627	85,300	89,139	93,150	97,342
Fixed Expenses	53,220	48,241	40,757	36,434	33,016	30,316	28,184	26,506	25,195	24,163	23,417	22,857	22,469	22,228	22,115
Other Income(Expenses)	0	423	803	1,446	2,218	3,127	4,151	5,273	6,499	7,834	9,286	10,846	12,524	14,320	16,244
Income Taxes	0	169	2,478	4,546	6,925	9,566	12,127	14,634	17,083	19,782	22,473	25,211	27,998	30,855	33,798
Net Earnings(Loss)	-658	6,940	14,866	20,456	24,857	28,745	32,288	35,663	38,870	42,001	45,033	48,040	51,195	54,387	57,675

B. Projected Balance Sheets

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Assets															
Current Assets	23,417	30,020	40,733	53,426	68,273	84,935	103,143	122,987	144,559	167,989	193,147	220,111	248,866	279,876	312,887
Net Fixed Assets	406,000	382,900	364,390	349,471	337,377	327,516	319,436	312,776	307,256	302,663	298,817	295,583	292,851	290,532	288,556
Total Assets	429,417	412,920	405,123	402,898	405,650	412,453	422,580	435,763	451,817	470,652	491,964	515,694	541,837	570,408	601,443
Liabilities and Net Worth															
Current Liabilities	26,536	26,824	28,567	32,072	34,988	38,250	41,537	44,844	48,175	51,815	55,564	59,418	63,390	67,527	71,818
Long Term Debt	119,166	108,643	101,244	93,810	87,203	81,308	76,030	71,282	66,894	63,108	59,567	56,332	53,365	50,632	48,100
Net Worth	283,715	278,353	274,312	277,017	283,458	292,895	305,013	319,637	336,648	355,730	376,832	399,943	425,073	452,250	481,518
Total Liabilities and Net Worth	429,417	412,920	405,123	402,898	405,650	412,453	422,580	435,763	451,817	470,652	491,964	515,694	541,837	570,408	601,443

C. Projected Cash Flow

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cash Flow from															
Operations	12,715	15,738	16,466	17,624	18,536	19,265	20,218	21,264	22,529	23,676	24,946	26,345	27,862	29,498	31,245
Changes in Working Capital	630	-374	1,848	1,676	2,048	2,364	2,339	2,317	2,295	2,559	2,618	2,673	2,748	2,837	2,943
Investment Transactions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financing Transactions	-10,835	-9,522	-8,399	-7,435	-6,607	-5,894	-5,278	-4,748	-4,286	-3,886	-3,539	-3,235	-2,968	-2,733	-2,526
Sub-Total	2,510	5,842	9,916	11,864	13,977	15,754	17,280	18,853	20,537	22,348	24,027	25,783	27,640	29,600	31,663
Plus:															
Dividends	15,000	15,675	16,360	17,117	17,886	18,693	19,534	20,413	21,332	22,291	23,295	24,343	25,436	26,583	27,779
NISA Contribution	2,112	2,206	2,306	2,412	2,520	2,634	2,752	2,876	3,005	3,141	3,282	3,430	3,584	3,745	3,914
RRSP Contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less Equity Reinvestment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow	19,623	23,726	28,606	31,393	34,383	37,081	39,566	42,141	44,874	47,780	50,603	53,556	56,662	59,928	63,356
Present Value of Net Cash Flows	17,212	18,256	19,308	18,587	17,650	16,693	15,604	14,773	13,798	12,888	11,974	11,116	10,317	9,571	8,878
Total Present Value of Cash Flows	217,338														

D. Projected Financial Ratios

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Return on Equity	-0.2%	2.2%	5.5%	7.4%	8.8%	9.8%	10.6%	11.2%	11.6%	11.8%	11.9%	12.0%	12.0%	12.0%	12.0%
Return on Total Assets	-0.2%	2.2%	3.7%	5.1%	6.2%	7.0%	7.6%	8.2%	8.6%	8.9%	9.2%	9.3%	9.4%	9.5%	9.6%
Gross Profit Margin	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%	62.2%
Net Profit Margin	-0.8%	10.1%	16.2%	21.2%	24.8%	27.3%	29.3%	31.0%	32.4%	33.4%	34.3%	35.0%	35.7%	36.3%	36.8%
Debt to Total Assets	33.0%	33.1%	32.2%	31.2%	30.1%	29.0%	27.8%	26.6%	25.5%	24.4%	23.4%	22.4%	21.5%	20.7%	19.9%

APPENDIX F

SCENARIO #1: SUMMARIZED FINANCIAL RESULTS

FARM WOODLOT ASSOCIATION OF SASKATCHEWAN
Economic Feasibility Analyses

Financial Summary

A. Projected Income Statements

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sales:															
Farm	86,534	88,330	92,313	96,467	100,808	105,345	110,085	115,039	120,216	125,626	131,279	137,186	143,360	149,811	156,552
Woodlot	6,234	8,604	8,991	9,396	9,819	10,261	10,722	11,205	11,709	12,236	12,787	13,362	13,963	14,592	15,248
Total Sales	92,768	96,942	101,305	105,863	110,627	115,605	120,808	126,244	131,925	137,862	144,065	150,548	157,323	164,403	171,801
Cost of Goods Sold	36,943	39,592	41,374	43,235	45,181	47,214	49,339	51,559	53,879	56,304	58,838	61,485	64,252	67,143	70,165
Gross Profit	55,825	57,350	59,931	62,628	65,446	68,391	71,469	74,685	78,046	81,558	85,228	89,063	93,071	97,259	101,636
Fixed Expenses	55,113	48,085	42,569	38,226	34,802	32,100	29,971	28,301	27,001	26,022	25,326	24,840	24,533	24,378	24,355
Other Income(Expenses)	0	718	1,202	1,916	2,762	3,751	4,847	6,045	7,348	8,775	10,337	12,012	13,809	15,734	17,795
Income Taxes	14	436	2,796	4,920	7,570	10,298	12,977	15,574	18,205	21,009	23,815	26,651	29,542	32,505	35,560
Net Earnings(Loss)	697	9,548	15,768	21,397	25,837	29,744	33,368	36,855	40,188	43,302	46,424	49,584	52,806	56,110	59,516

B. Projected Balance Sheets

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Assets															
Current Assets	27,959	36,153	47,940	61,789	77,870	95,642	115,015	136,051	159,046	184,150	211,063	239,888	270,740	303,728	338,966
Net Fixed Assets	407,680	384,244	365,465	350,331	338,065	328,068	319,877	313,128	307,540	302,888	298,997	295,727	292,966	290,625	288,630
Total Assets	435,639	420,397	413,405	412,121	415,935	423,710	434,891	449,179	466,585	487,038	510,060	535,616	563,706	594,352	627,596
Liabilities and Net Worth															
Current Liabilities	29,450	30,650	33,485	36,194	39,533	43,049	46,608	50,175	53,863	57,820	61,878	66,055	70,372	74,851	79,511
Long Term Debt	121,118	111,430	102,844	95,197	88,350	82,185	76,600	71,506	66,996	63,106	59,567	56,332	53,365	50,632	48,106
Net Worth	285,070	278,317	277,077	280,729	288,052	298,476	311,683	327,498	345,728	366,112	388,614	413,229	439,969	468,869	499,979
Total Liabilities and Net Worth	435,639	420,397	413,405	412,121	415,935	423,710	434,891	449,179	466,585	487,038	510,060	535,616	563,706	594,352	627,596

C. Projected Cash Flow

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cash Flow from:															
Operations	14,490	16,682	17,539	18,787	19,588	20,421	21,399	22,564	23,818	25,035	26,393	27,884	29,501	31,242	33,106
Changes in Working Capital	3,544	439	2,040	1,879	2,470	2,608	2,612	2,576	2,653	2,874	2,928	2,995	3,083	3,189	3,311
Investment Transactions	(2,100)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financing Transactions	(8,882)	(9,688)	(8,586)	(7,647)	(6,846)	(6,165)	(5,585)	(5,094)	(4,512)	(3,888)	(3,539)	(3,235)	(2,968)	(2,733)	(2,526)
Sub-Total	7,052	7,433	10,992	13,018	15,212	16,865	18,425	20,046	21,959	24,022	25,782	27,644	29,616	31,698	33,890
Plus:															
Dividends	15,000	15,675	16,380	17,117	17,888	18,693	19,534	20,413	21,332	22,291	23,295	24,343	25,438	26,583	27,779
MIEA Contribution	2,113	2,208	2,308	2,412	2,520	2,634	2,752	2,876	3,005	3,141	3,282	3,430	3,584	3,745	3,914
RRSP Contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less: Equity Reinvestment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow	24,166	25,316	29,680	32,548	35,620	38,191	40,711	43,335	46,296	49,454	52,359	55,417	58,639	62,026	65,583
Present Value of Net Cash Flows	21,198	19,480	20,033	19,271	18,500	17,399	16,270	15,191	14,236	13,340	12,389	11,502	10,676	9,906	9,188
Total Present Value of Cash Flows	228,581														

D. Projected Financial Ratios

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Return on Equity	0.2%	3.4%	5.7%	7.6%	9.0%	10.0%	10.7%	11.3%	11.6%	11.8%	11.9%	12.0%	12.0%	12.0%	11.9%
Return on Total Assets	0.2%	2.3%	3.8%	5.2%	6.2%	7.0%	7.7%	8.2%	8.6%	8.9%	9.1%	9.3%	9.4%	9.4%	9.5%
Gross Profit Margin	60.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%	59.2%
Net Profit Margin	0.8%	9.8%	15.6%	20.2%	23.4%	25.7%	27.6%	29.2%	30.5%	31.4%	32.2%	32.9%	33.6%	34.1%	34.6%
Debt to Total Assets	34.6%	33.8%	33.0%	31.9%	30.7%	29.6%	28.3%	27.1%	25.9%	24.8%	23.8%	22.8%	22.0%	21.1%	20.3%

APPENDIX G

SCENARIO #2
SUMMARIZED FINANCIAL RESULTS

FARM WOODLOT ASSOCIATION OF SASKATCHEWAN
Economic Feasibility Analyses

TAEM

Financial Summary

A. Projected Income Statements

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sales:															
Farm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodlot	4,701	4,913	5,134	5,365	5,606	5,859	6,122	6,398	6,686	6,986	7,301	7,629	7,973	8,331	8,706
Total Sales	4,701	4,913	5,134	5,365	5,606	5,859	6,122	6,398	6,686	6,986	7,301	7,629	7,973	8,331	8,706
Cost of Goods Sold	4,045	4,219	4,409	4,607	4,814	5,031	5,258	5,494	5,741	6,000	6,270	6,552	6,847	7,155	7,477
Gross Profit	656	694	725	758	792	827	865	903	944	987	1,031	1,077	1,126	1,177	1,230
Fixed Expenses	6,900	6,110	5,673	5,366	5,169	5,059	5,021	5,040	5,104	5,256	5,523	5,835	6,191	6,589	7,029
Other Income(Expenses)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income Taxes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Earnings(Loss)	(6,244)	(5,416)	(4,948)	(4,609)	(4,377)	(4,232)	(4,156)	(4,136)	(4,160)	(4,270)	(4,492)	(4,758)	(5,065)	(5,413)	(5,800)

B. Projected Balance Sheets

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Assets															
Current Assets	(446)	(3,997)	(7,729)	(11,746)	(16,064)	(20,706)	(25,695)	(31,057)	(36,827)	(40,141)	(44,541)	(49,277)	(54,370)	(59,848)	(65,736)
Net Fixed Assets	16,000	12,800	10,240	8,192	6,554	5,243	4,194	3,355	2,684	2,147	1,718	1,374	1,100	880	704
Total Assets	15,554	8,803	2,511	(3,554)	(9,510)	(15,463)	(21,501)	(27,701)	(33,342)	(37,994)	(42,823)	(47,902)	(53,271)	(58,968)	(65,032)
Liabilities and Net Worth															
Current Liabilities	3,125	3,208	3,385	3,566	3,755	3,951	4,153	4,363	4,579	4,824	5,114	5,420	5,743	6,086	6,448
Long Term Debt	9,300	8,509	7,615	6,605	5,464	4,174	2,717	1,070	0	0	0	0	0	0	0
Net Worth	3,129	(2,914)	(8,490)	(13,725)	(18,729)	(23,588)	(28,371)	(33,134)	(37,921)	(42,818)	(47,937)	(53,322)	(59,014)	(65,054)	(71,481)
Total Liabilities and Net Worth	15,554	8,803	2,511	(3,554)	(9,510)	(15,463)	(21,501)	(27,701)	(33,342)	(37,994)	(42,823)	(47,902)	(53,271)	(58,968)	(65,032)

C. Projected Cash Flow

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cash Flow from:															
Operations	(2,871)	(2,843)	(3,015)	(3,188)	(3,365)	(3,548)	(3,735)	(3,926)	(4,116)	(4,360)	(4,690)	(5,041)	(5,417)	(5,820)	(6,251)
Changes in Working Capital	3,125	83	177	182	189	196	203	209	216	245	290	306	324	343	363
Investment Transactions	(20,000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financing Transactions	19,300	(791)	(896)	(1,010)	(1,141)	(1,290)	(1,457)	(1,647)	(1,070)	0	0	0	0	0	0
Sub-Total	(446)	(3,552)	(3,732)	(4,016)	(4,318)	(4,642)	(4,989)	(5,362)	(4,970)	(4,115)	(4,400)	(4,735)	(5,094)	(5,477)	(5,888)
Plus:															
Dividends	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HISA Contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RRSP Contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less: Equity Reinvestment	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow	(10,438)	(3,552)	(3,732)	(4,016)	(4,318)	(4,642)	(4,989)	(5,362)	(4,970)	(4,115)	(4,400)	(4,735)	(5,094)	(5,477)	(5,888)
Present Value of Net Cash Flows	(9,156)	(2,733)	(2,519)	(2,378)	(2,243)	(2,115)	(1,994)	(1,880)	(1,528)	(1,110)	(1,041)	(983)	(927)	(875)	(825)
Total Present Value of Cash Flows	(32,306)														

D. Projected Financial Ratios

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Return on Equity	-199.6%	185.9%	58.3%	33.6%	23.4%	17.9%	14.6%	12.5%	11.0%	10.0%	9.4%	8.9%	8.6%	8.3%	8.1%
Return on Total Assets	-40.1%	-61.5%	-197.1%	129.7%	46.0%	27.4%	19.3%	14.9%	12.5%	11.2%	10.5%	9.9%	9.5%	9.2%	8.9%
Gross Profit Margin	14.0%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%	14.1%
Net Profit Margin	-132.8%	-110.2%	-96.4%	-85.9%	-78.1%	-72.2%	-67.9%	-64.7%	-62.2%	-61.1%	-61.5%	-62.4%	-63.5%	-65.0%	-66.6%
Debt to Total Assets	79.9%	133.1%	436.2%	-286.2%	-96.9%	-52.5%	-32.0%	-19.6%	-13.7%	-12.7%	-11.9%	-11.3%	-10.8%	-10.3%	-9.9%

APPENDIX H

SCENARIO #3: SUMMARIZED FINANCIAL RESULTS

TAEM

FARM WOODLOT ASSOCIATION OF SASKATCHEWAN
Economic Feasibility Analysese

Financial Summary

A. Projected Income Statements

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sales:															
Farm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodlot	149,850	156,593	163,640	171,004	178,699	186,740	195,144	203,925	213,102	222,691	232,712	243,185	254,128	265,564	277,514
Total Sales	149,850	156,593	163,640	171,004	178,699	186,740	195,144	203,925	213,102	222,691	232,712	243,185	254,128	265,564	277,514
Cost of Goods Sold	50,973	53,259	55,655	58,160	60,777	63,512	66,370	69,357	72,478	75,739	79,147	82,709	86,431	90,320	94,385
Gross Profit	98,877	103,335	107,985	112,844	117,922	123,228	128,774	134,569	140,624	146,952	153,565	160,475	167,697	175,243	183,129
Fixed Expenses	70,200	57,244	52,013	48,002	44,846	42,272	40,078	38,106	36,234	35,390	36,164	37,129	38,260	39,537	40,947
Other Income(Expenses)	0	5,985	9,822	13,669	17,598	21,642	25,839	30,216	34,799	40,121	46,534	53,356	60,598	68,286	76,449
Income Taxes	5,861	15,901	22,323	28,469	34,341	40,094	45,851	51,706	57,738	63,760	69,660	75,810	82,233	88,959	96,016
Net Earnings(Loss)	22,816	36,175	43,471	50,042	56,333	62,504	68,684	74,973	81,451	87,924	94,275	100,893	107,802	115,033	122,616

B. Projected Balance Sheets

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Assets															
Current Assets	92,078	151,104	210,296	270,739	332,959	397,518	464,868	535,376	617,253	715,908	820,869	932,278	1,050,555	1,176,132	1,309,452
Net Fixed Assets	395,000	372,000	354,200	340,290	329,312	320,562	313,518	307,794	303,100	299,215	295,974	293,250	290,943	288,977	287,291
Total Assets	487,078	523,104	564,496	611,029	662,271	718,080	778,386	843,170	920,352	1,015,123	1,116,843	1,225,528	1,341,498	1,465,108	1,596,743
Liabilities and Net Worth															
Current Liabilities	46,889	55,277	62,764	69,982	76,931	83,759	90,582	97,489	104,546	112,020	120,092	128,511	137,306	146,510	156,156
Long Term Debt	93,000	85,090	76,152	66,051	54,638	41,741	27,167	10,699	0	0	0	0	0	0	0
Net Worth	347,189	382,737	425,581	474,996	530,702	592,579	660,636	734,982	815,806	903,103	996,751	1,097,017	1,204,192	1,318,598	1,440,587
Total Liabilities and Net Worth	487,078	523,104	564,496	611,029	662,271	718,080	778,386	843,170	920,352	1,015,123	1,116,843	1,225,528	1,341,498	1,465,108	1,596,743

C. Projected Cash Flow

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cash Flow from:															
Operations	52,189	58,548	60,644	63,325	66,684	70,628	75,101	80,070	85,519	91,181	96,889	102,990	109,482	116,372	123,674
Changes in Working Capital	46,889	8,388	7,487	7,218	6,949	6,828	6,823	6,906	7,058	7,474	8,072	8,419	8,795	9,206	9,646
Investment Transactions	(150,000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financing Transactions	143,000	(7,910)	(8,938)	(10,100)	(11,413)	(12,897)	(14,574)	(16,468)	(10,699)	0	0	0	0	0	0
Sub-Total	92,078	59,026	59,192	60,443	62,220	64,559	67,350	70,508	81,877	98,655	104,961	111,410	118,277	125,577	133,320
Plus:															
Dividends	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RESA Contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RRSP Contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less: Equity Reinvestment	50,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow	42,078	59,026	59,192	60,443	62,220	64,559	67,350	70,508	81,877	98,655	104,961	111,410	118,277	125,577	133,320
Present Value of Net Cash Flows	36,910	45,419	39,953	35,787	32,315	29,412	26,916	24,717	25,178	26,612	24,836	23,124	21,535	20,056	18,678
Total Present Value of Cash Flows	431,446														

D. Projected Financial Ratios

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Return on Equity	6.6%	9.5%	10.2%	10.5%	10.6%	10.5%	10.4%	10.2%	10.0%	9.7%	9.5%	9.2%	9.0%	8.7%	8.5%
Return on Total Assets	4.7%	6.9%	7.7%	8.2%	8.5%	8.7%	8.8%	8.9%	8.8%	8.7%	8.4%	8.2%	8.0%	7.9%	7.7%
Gross Profit Margin	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%
Net Profit Margin	15.2%	23.1%	26.6%	29.3%	31.5%	33.5%	35.2%	36.8%	38.2%	39.5%	40.5%	41.5%	42.4%	43.3%	44.2%
Debt to Total Assets	28.7%	26.8%	24.6%	22.3%	19.9%	17.5%	15.1%	12.8%	11.4%	11.0%	10.8%	10.5%	10.2%	10.0%	9.8%

APPENDIX I

STANDARDS FOR GRADING HARDWOOD LUMBER

SPECIAL INSPECTION

KILN DRIED LUMBER

The Model State Regulation adopted by the National Conference on Weights and Measures on July 21, 1977 specifies that: "(1) Sales of hardwood lumber measured after kiln drying shall be quoted, invoiced, and delivered on the basis of net board footage, with no addition of footage for kiln drying shrinkage. (2) Sales of hardwood lumber measured prior to kiln drying shall be quoted, invoiced, and delivered on the basis of net board footage before kiln drying. If the lumber is to be kiln dried at the request of the purchaser, the kiln drying charge shall be clearly shown and identified on the quotation and invoice." This regulation has been approved by the NHLA Board of Managers and is recognized as law in many states and local jurisdictions.

When inspecting kiln dried lumber National Inspectors will make no additions for estimated kiln shrinkage.

Contracts for kiln dried lumber should specify clearly which of the following rules is to govern:

Standard Kiln Dried Rule

If Official National Inspection is ordered after lumber sold under this rule has been kiln dried, the following specifications shall be applied:

Checks and warp shall not be considered defects. No distinction can be made between checks and warp which may have been present before kiln drying and which developed during kiln drying. Rough kiln dried lumber specified 3/8 in. to 1¾ in. thick may be 1/16 in. scant of the nominal thickness; 2 in. and thicker may be 1/8 in. scant and the 10% of scant quartered lumber admitted by Paragraph 35 may be 3/32 in scant on one edge in 1 in. to 1½ in. lumber and 3/16 in. on one edge in 2 in. and thicker. The minimum widths mentioned in all grades may be ¼ in. scant in width and the 10% admitted by Paragraph 10 may be ½ in. scant in width. In other respects the rules for grading air dried lumber shall apply.

National Inspectors will mark certificates under these specifications "Standard Kiln Dried Rule Applied."

Special Kiln Dried Rule

Kiln dried lumber will be graded and measured as such, the grading rules for air dried lumber to be applied in all respects, except that the allowance for scant thickness and width as defined in the Standard Kiln Dried Rule will apply

National Inspectors will mark certificates under this rule "Special Kiln Dried Rule Applied."

KILN DRYING OF HARDWOOD LUMBER

In order to minimize dimensional changes in service, hardwood lumber used for most products must have moisture removed by placing it in a dry kiln with controlled humidity and heat for a period of time determined by the starting and the desired moisture content, the species, and the thickness. Other advantages of kiln drying are the relieving of stresses and the killing of insects and organisms causing stain and decay

Moisture content of wood is ordinarily expressed as the percentage of the wieght of water in the wood to the oven dry weight of the wood. Lumber with a moisture content above 30% is considered as green or partly air dried lumber. The moisture content of air dried lumber is generally from 15 to 30%. Dry kilns usually dry hardwood lumber to a moisture content of from 6% to 10%, and kiln dried lumber will gradually adjust to the humidity of its final location.

Kiln drying is a specialized technical process. Custom kiln drying is a contractual agreement between the kiln operator and the owner of the lumber. Shrinkage of hardwood lumber in kiln drying varies from about 5% to 9%, depending on species and initial dryness. Some degrade also occurs in kiln drying.

The Model State Regulation for the measurement of kiln dried lumber appears on page 47 of this Rules Book, along with the specifications for grading kiln dried lumber under the Standard Kiln Dried Rule and the Special Kiln Dried Rule.

Technical References:

"Wood Handbook" (Agriculture Handbook No. 72), for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price: $7.85. Also available for $1.00 is "Dry Kiln Operator's Manual" (Agriculture Handbook No. 188).

Forest Products Laboratory, U.S.D.A. Forest Service, P.O. Box 5180, Madison, Wisconsin 53705. Cooperative Extension Offices in the various states.

Eastern Forest Products Laboratory, Canadian Forest Service, 800 Montreal Road, Ottawa, Ontario K1A 0W5.

TAEM

GRADES OF HARDWOOD (POPLAR) LUMBER IN THE UNITED STATES[a]

FAS means first and second grade. The lumber or boards must be a minimum of 6 in. wide and 8 ft. long. This grade must yield 91.66% of clear-face cutting.

S & S means select and better grade. The lumber or boards must be a minimum of 4 in. wide and 6 ft. long. Minimum clear-cuttings must be 4 in. wide and 5 ft. long or 3 in. wide and 7 ft. long.

#1C means No. 1C common grade. The width of the lumber or boards must be a minimum of 3 in. wide and 4 ft. long. Minimum cutting must be 4 in. wide and 3 ft. long.

#2A means No. 2A common grade. The width of the lumber or boards must be a minimum of 3 in. wide and 4 ft. long. The proportion of clear cutting in this grade is smaller than in grade No. 1C.

#3A means No. 3A common grade. The width of the lumber or boards must be a minimum of 3 in. wide and 4-16 ft. long. Number 3A grade admits pieces that will yield 33.3% clear face lumber cutting not less than 3 in. wide and 2 feet long.

#3B means No. 3B common grade. The width of the lumber or boards must have 25% sound cutting not less than 1.5 in. wide containing clear-cutting not less than 36 sq. in. There is no limit to the number of cuttings.

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[a] Source: U.S. National Hardwood Lumber Association. 1986. Rules for measurement and inspection of hardwood and cypress lumber. Memphis, Tennessee.